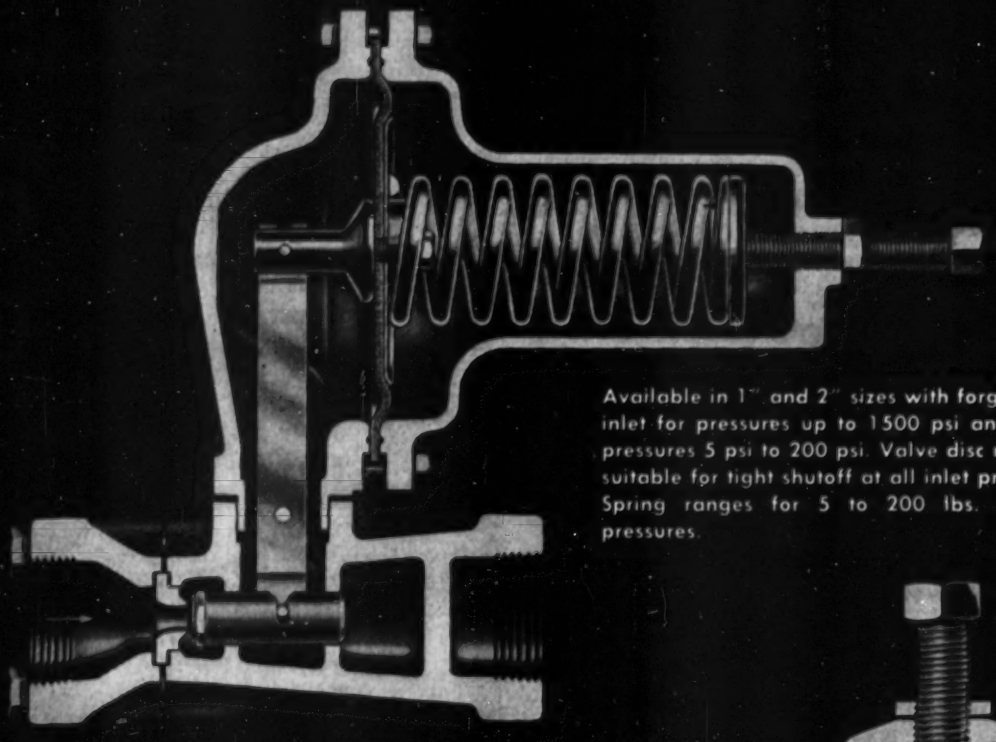
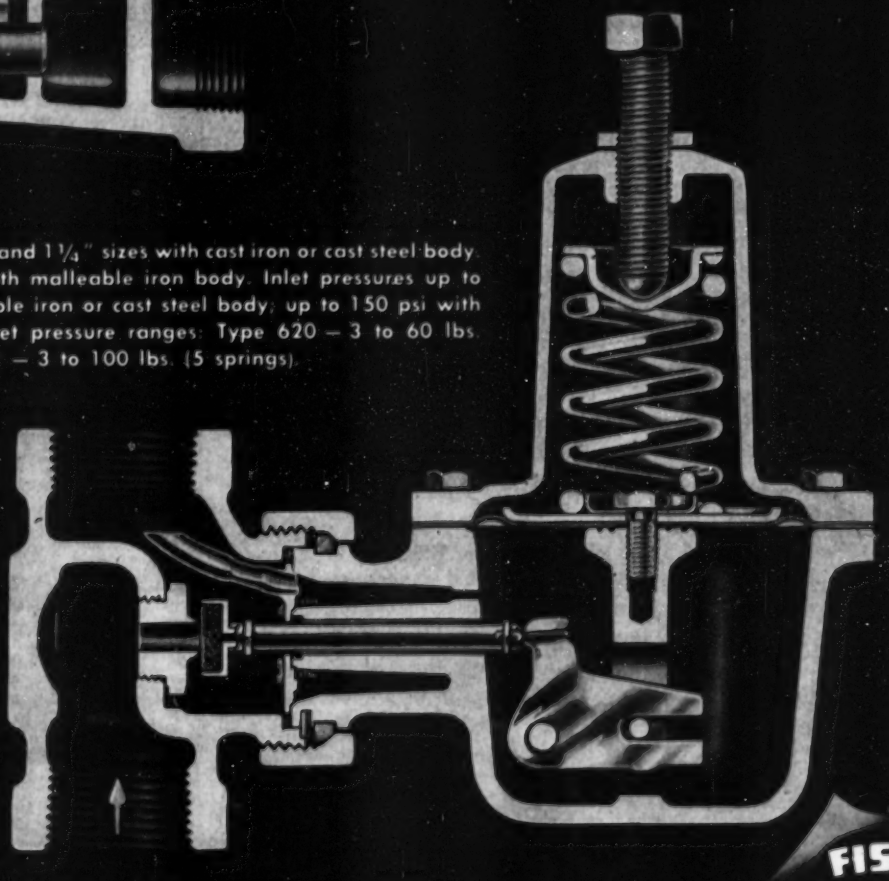


Available in 1" and 2" sizes with forged steel inlet for pressures up to 1500 psi and outlet pressures 5 psi to 200 psi. Valve disc material suitable for tight shutoff at all inlet pressures. Spring ranges for 5 to 200 lbs. reduced pressures.

Available in ¾", 1" and 1¼" sizes with cast iron or cast steel body. ¾" and 1" sizes with malleable iron body. Inlet pressures up to 750 psi with malleable iron or cast steel body; up to 150 psi with cast iron body. Outlet pressure ranges: Type 620 — 3 to 60 lbs. (4 springs). Type 621 — 3 to 100 lbs. (5 springs).



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BETTER GAS PRESSURE CONTROL

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GAS Thermally Thinking

Ad hoc or ad infinitum?

WE'VE just had an introduction to an *ad hoc* committee which we cordially hope enjoys the shortest life on record. The committee hopes so, too.

Once the committee's immediate goal is achieved, it plans to vanish into the blue, like gas issuing from a blowdown stack. And may it achieve that goal in the shortest time possible.

But we're speaking of it now as an *ad hoc* committee only. Why must its organization expire when the immediate end is attained?

The committee is the Natural Gas & Oil Resources Committee (headquarters, Room 5400, 350 Fifth Avenue, New York 1), a group that purportedly exists only for the purpose of winning over public opinion for an early amendment to the Natural Gas Act. The moment the President affixes his signature to the awaited bill, the committee will evaporate, by prearranged plan.

We submit that it shouldn't.

The committee ostensibly belongs to no association, and thence springs its power. Unhampered by the altogether necessary and democratic red tape that sometimes slows an association's progress to a frustrating crawl, the committee has been able to move with startling speed toward its goal at a time when the need for speed is paramount. Time is of the essence. If it weren't for the seriousness of the regulatory situation, it is a bit dubious that the members would welcome the introduction of a bill at this time. Swaying public opinion, particularly when there's a major educational job involved, is a long, hard task. What can be done in a few short weeks is problematical; the committee knows it, but it is faced with a crisis, and any gains, no matter how far short of the goal, must be counted as worth the candle.

An association couldn't have organized for such an emergency job. As a matter of plain fact, associations haven't been able to knit together a strong public relations program on a long-term basis, even given all the time in the world to do it. AGA's program is strictly limited, and the INGAA itself has been working pretty much at the local level. Such procedures have their place, but they lack the impact of a concerted nationwide effort; and they haven't that inherent flexibility, or even the clearly defined purpose, that makes the committee's program appear strong. As an emergency-bred organization, it has a very clear-cut goal; but why shouldn't the broader, long-range goals of winning friends among consumers and keeping regulation "loose" be sufficient to hold the committee together on a permanent basis?

There's a continuing story to tell, but it must be told completely. Shudders have gone through the industry when national magazines have publicized the Murchisons and the Hunts, the Cullens and the McCarthys. That's only a small part of the story, but no amount of attempts at suppression of it would succeed, nor should they. The other side of the story should be told, too. Taken altogether, it's a glamorous and romantic story, and if there still remains a spark of the free enterprising, pioneering spirit in the U. S. public, this should bring it alive. America is still a gambler at heart, when stimulated.

The producers have found they must tell their own story, if it is to be told at all. Even sympathetic utilities hesitate to carry the banner. And, certainly, there are none too many of these.

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Fig. A602 7" OD
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Fig. A706-9 7" API Series 900
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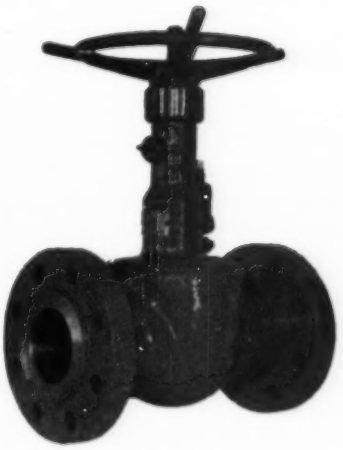

Fig. LP402-6 4" ASA 600 Lb.

Thousands of these valves now control commercial gas wells and gas storage wells throughout the United States and Canada, as well as other parts of the world. They offer low cost maintenance, easy operation in all kinds of weather conditions, two and one quarter turns to open or close and a positive dependable shut off. "Switching" operations can be quickly performed by one man when a lease is equipped with ORBIT DRILLING VALVES. Special bonnet lubricant will be furnished in ORBIT DRILLING VALVES specified for use in hydrocarbon ground storage wells. When used on natural gas and natural gas storage wells, any good grade of lubricant is all that is necessary.

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ORBIT FORGED STEEL FLOWLINE VALVES are rising stem type, full round opening, friction free seating. Body and bonnet are made of drop forgings and bonnet is welded to body to form an integral pressure vessel. Operating mechanism is isolated from valve cavity by plastic stem packing that is adjustable. Arrow on body indicates direction of flow; however ORBIT FORGED STEEL FLOWLINE VALVES will hold reverse pressures up to the amount of the working pressure stamped on the identification plate attached to the valve. Sizes: 1", 1½", 2", 2½", 3" and 4", ASA Class and API Oil Field Rating. Maximum rated working temperature 250° Fahrenheit.

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highlights

GAS SPOT NEWS, TRENDS, COMMENT ON GAS INDUSTRY AFFAIRS

Is the silence ominous?

Things have quieted down, temporarily at least, in the Pacific Northwest. Pacific, Westcoast, and El Paso seemed to have formed a happy threesome, but Pacific Gas & Electric Co. is still a holdout. It seems doubtful that El Paso could dispose of 250 MMcf between Mountain Home, Idaho, and the California border. So the rumors are starting again. Could the Northwest absorb the capacity of both lines? Or does El Paso have another market up its sleeve?

Texas moves toward a wellhead price minimum

Rep. J. B. Walling of Wichita Falls has submitted an "economic waste statute" to amend the state's Revised Civil Statutes so as to empower the railroad commission to set price minimums. Where the statute prohibits "waste" of natural gas, the amendment would add the sentence, "The term 'waste,' in addition to its ordinary meaning, shall include economic waste." The commission would also be directed to determine, upon motion or application, "the value or values required to be received for or attributed to gas produced from any well, field, or area of a field in this state in order to prevent waste . . ." "Until this is done, we will be helping to consolidate FPC jurisdiction over natural gas production," Rep. Walling declares.

In the producer-regulation picture, things were popping all over

The Natural Gas & Oil Resources Committee went into action in January (see pages 6 and 132). Meanwhile the FPC hearings at which the producers were supposed to tell how they wished to be regulated produced little more than sound and fury, and a statement of the positions of the various factions involved (see page 130). Distributing utilities were generally lining up on the side of regulation. Rep. Ikard of Texas was preparing a bill to amend the Natural Gas Act. February lines up as an even bigger month than January.

Escape clauses face test this month

The 14 Clayton and LaGloria field (Texas) producers who would terminate deliveries to Texas Illinois have been ordered to show cause, and hearings have been set for Feb. 7. All Texas Illinois long-term contracts contain escape clauses, so a victory for the 14 could conceivably cut off all gas to the Peoples Gas (Chicago) affiliate.

Will tomorrow's computers do their own "programming"?

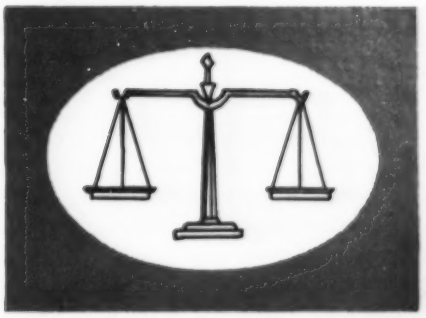
International Business Machines Corp. has under development a computer that would eliminate the sometimes arduous labor of programming a problem. The Mathematical Formula Translating System (FORTRAN) would be used with the Type 704 computer to do just that; the programmer would need only to enter an algebraic formula into the computer, which would proceed to scan it and write the program automatically.

Contractors are guardedly optimistic

"We have made a survey of pipeline work proposed for 1955 and expect the coming year to be one of the best we have yet experienced," G. A. Manuel, outgoing president, told the delegates to the Pipe Line Contractors Association's annual convention (see page 128). Fourteen thousand miles of *mainline* will be laid this year. In 1954, 120 spreads laid 11,000 miles of line at a total construction cost (excluding materials) of $170 million. That was 80% of the average dollar volume for the past three years. Incoming president H. C. Price concurs—*if* Congress amends the Natural Gas Act.

*regulatory and legislative trends

Capitol Hill holds the answer to the Phillips controversy



With interest mounting to fever pitch in the efforts of producers to bring about amendatory legislation that will free them from federal control, it is pertinent to review the events of the past seven months since the Supreme Court ruled that FPC has the duty to regulate the price charged by the independent producer who sells natural gas that is ultimately transported and resold in interstate commerce — a duty that the commission itself for 16 years of operating under the Natural Gas Act had denied.

MOMENTARILY, a bill is expected to be introduced into Congress to eliminate the consequences of the Supreme Court's decision in the Phillips case, and to exempt independent producers of natural gas from federal regulation.

The repercussions in the gas-producer and gas-consumer states have been numerous and violent. Adversaries on this issue of federal regulation vs. free competition to fix the field prices for natural gas are preparing to meet on the only remaining battleground--Capitol Hill.

The reasoning of the United States Supreme Court, as well as that of the Federal Power Commission in the controversial Phillips Petroleum Co. case, will be utilized in the congressional conflict so a review is appropriate. In a 5-3 decision, with one justice not participating, the court recited that the Phillips Petroleum Co., as an independent natural gas producer, sold gas to five interstate pipeline companies which transported and resold the gas to consumers and local distributing companies in 14 states. About one-half of the gas was produced by Phillips and the remainder purchased from other producers. Much of the gas was produced in connection with the production of oil. The gas was gathered and put through processing plants where extractable products and impurities were removed. After the processing was completed the gas was sold and delivered to interstate pipeline companies, which transported it to market areas. The Natural Gas Act provides that Federal regulation shall not apply to the "production or gathering of natural gas." Although it was admitted that Phillips engaged in the sale in interstate commerce of natural gas for resale, the Federal Power Commission held that the sales by Phillips were a part of the production or gathering of natural gas to which the commission's jurisdiction did not extend. The Supreme Court majority, however, found that production and gathering ended before the sales were made by Phillips. The majority of the Supreme Court concluded: "We believe that the legislative history indicates a congressional intent to give the commission jurisdiction over the rates of all wholesales of natural gas in interstate commerce, whether by a pipeline company or not and whether occurring before, during, or after transmission by an interstate pipeline company."

Predicted consequences of federal regulation

Producers, interstate pipeline companies, retail gas distributors, and the consumers have predicted the consequences that will flow from federal regulation of independent gas producers.

One producer, Hines Baker, president of Humble Oil & Refining Co., told the Investment Bankers Association recently that the natural gas producing business is now in a state of chaos. He said that the fixing of the price at which a producer sells natural gas in interstate commerce results in selecting natural gas as the only commodity of a producer to be brought under federal price fixing. He added that there is no basic difference between the producer of natural gas and the producer of oil, coal, livestock, or lumber. He asserted that this situation required early congressional action in the public interest to free the producers field price of natural gas from federal controls.

Another producer, K. S. Adams, chairman of the Phillips Petroleum Co., declared to the American Gas Association convention last October that "Those who championed the cause of regulation are about to learn that they may have won a battle only to lose the war . . . Already the operating burdens and economic uncertainties thrust upon producers by federal regulation have served to reduce the interstate gas supply for distribution by your companies. The Supreme Court's decision of last June has resulted in the abandonment, curtailment or suspension of at least three major gas transmission projects."

Mr. Adams added that curtailment of pipeline projects is proof that the consumers' gas supply will be gradually reduced under such federal regulation. He asserted that thousands of homes will not have any natural gas, and that many more will be denied the additional gas they require. He asked how a producer could afford the gamble of contracting for the sale of his gas when he has no assurance that he will receive the price contained in the contract because regulatory power is paramount to private contracts. He pointed out that the producers who will avoid the interstate market will find presently large and expanding market outlets for gas within the state in which it is produced, thus avoiding federal price regulation. He stated that there is in the process of building within the major gas producing states the greatest industrial empire ever seen in the United States, requiring huge investments which need vast contracted gas reserves

*Contributed comment on current developments by an expert in the field, to be a frequent feature in GAS for 1955.

to protect those investments.

Paul Kayser, president of the El Paso Natural Gas Co., which is one of the major interstate pipeline companies, told the California Manufacturers Association recently that there should be no federal regulation of producers prices.

Mr. Kayser emphasized that oil and gas furnish more than 63% of all the energy used in this country, which demonstrates the importance of exploration and discovery in order to maintain the supply. He added that "No one can produce a given quantity of gas at any given place. It can only be produced by careful, aggressive, intelligent exploration to find it in those recesses of the earth where nature has stored it thousands of feet below the surface. No scientist or technician can guarantee the finding of gas at any given place. The most that the best geologists, geophysicists and petroleum engineers can do is to assist in the painstaking, sometimes extremely discouraging, search for gas. No one will enter into this business for a fixed return. There is no way to calculate the proper basis for a return. There are only two ways that such exploration can be carried out—one is by making it profitable through the field price for people to enter the search, and the other is for the government to take over the oil and gas as minerals and produce these commodities as needed. This is obviously socialism."

Mr. Kayser appraised the importance of the price paid to gas producers as it relates to the price paid by the ultimate consumer hundreds of miles away. He said that the regulation of the transportation and distribution of gas has always been recognized as proper governmental practice, which accounts for regulation of approximately 90% of the price of gas at the point of consumption. Regulation of a monopoly has been justified as a substitute for competition. There is no monopoly of natural gas production and the forces of competition have produced a fair field price. Mr. Kayser asserted that, without remedial congressional action, state regulation of conservation of oil and gas resources will be eventually replaced by federal regulation. He sees a conflict during the transition.

The United States Supreme Court is considering a case bearing on the controversial question of State versus Federal regulation of independent gas producers. The case involves an appeal by the Natural Gas Pipeline Co. of America from a decision of the Oklahoma Supreme Court upholding the state's right to set a minimum price of 9.8 cents per Mcf for gas in the field. In this case, Oklahoma for the first time fixed the minimum price for processed natural gas as well as raw natural gas. The Oklahoma Supreme Court held that this was done to eliminate waste and for conservation purposes and was within state authority. The pipeline company contended that the Oklahoma commission interfered with interstate commerce and that the regulation of gas destined for out-of-state transportation comes under the authority of the Federal Power Commission since the United States Supreme Court's Phillips decision.

FPC exercises unwanted authority

The Federal Power Commission did not seek the authority to regulate independent producers, but since the Supreme Court's Phillips decision it has undertaken to perform its duties conscientiously. The commission has issued rules governing the filing of rate schedules and applications for certificates of public convenience and necessity by independent producers, and the result has been an avalanche of white papers in Washington.

During the last six months of 1954, the commission suspended proposed rate increases by independent gas producers aggregating more than $4 million, but at the same time it allowed rate increases to go into effect totaling about $400,000.

The Federal Power Commission is mindful of the complexities of fixing the price for natural gas in the field because of the inseparable relationships of oil and gas production. The commission has invited all interested persons to present principles and methods upon which producers should be based. On last Jan. 11, the commission heard recommendations from representatives of every segment of the gas industry The chairman of the Federal Power Commission recently made a significant statement. The commission knows, he stated, that the exploration and development of natural gas supplies embrace many risks and that the financial rewards must be equal to those risks to encourage the future exploration and production of natural gas. He concluded that the commission intends to recognize this fact in fixing rates regardless of the method employed in testing the reasonableness of independent producers rates. Although administrative philosophy changes with the replacement of Federal Power Commissioners, this enlightened statement by the existing administrators of the Natural Gas Act contains hope for the producers under regulation.

On Dec. 16, 1954, the FPC adopted Order No. 174-B, which modifies prior regulations for independent producers. The commission revised the statement prohibiting abandonment of service by producers, without first obtaining Federal Power Commission permission, by adding that the rules do not interfere with compliance by a producer with valid conservation orders of a state. The commission recently denied a request by the Sinclair Oil & Gas Co., contained in its application for certificates, for authority to abandon the service and sales involved at the expiration of its contracts to supply natural gas. Sinclair makes sales as an independent producer, and the commission stated that it could not abandon service without proving that its available supply of natural gas is depleted to the extent that continuance of service is unwarranted, or that the public convenience and necessity permits such abandonment.

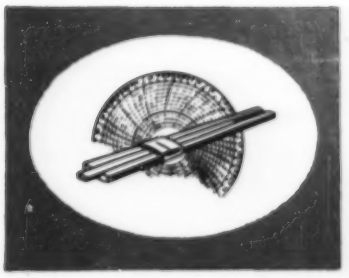
The commission also took steps to outlaw certain favored nations clauses and provisions for escalation of the seller's price after May 1, 1955. A pipeline company that is trying to prove it has an adequate gas supply for a project cannot include any gas purchase contracts where the pipeline is required to pass back to its supplier some part of any rate increase it obtains. Nor can the pipeline company include gas supplies where the contract requires it to pay its supplier in a given area some new higher prices a third person pays.

Corrective legislation or continued regulation

Only Congress can give the relief that the gas producers have been seeking. The Federal Power Commission is obligated to regulate independent gas producers until Congress amends the Natural Gas Act.

The year 1955 may be a fateful one for the future cost, discovery, development and utilization of this nation's limited natural gas reserves. The future convenience and expense of 22 million existing natural gas customers, affecting a population of more than 60 million people, depend upon the wisdom and consequences of proposed legislation to exempt independent gas producers from Federal regulation.

technical trends



• By GUY CORFIELD

Plastic notes

The rapid developments in types and uses of plastics continue to hold the interest of industry, including the gas industry, which is chiefly attracted by the possibilities of plastic for underground piping. It is expected that, through the current activities of the AGA subcommittee on plastic pipe standards in cooperation with the Society of the Plastics Industry and the plastics manufacturers, technical criteria will soon be obtainable whereby chemical and physical properties of the various types and formulas of plastic can be made available so that plastic pipe can be evaluated and installed on an engineering basis comparable to the use of conventional construction materials. Meanwhile it is interesting to note developments in the mushrooming plastics industry.

A continuing trend is the entry of steel into the plastics field, presumably with the recognition that it is better to participate in than to resist significant competition. One of the latest entrants is the National Tube division of U. S. Steel, which is completing facilities to produce a wide variety of plastic pipe at its Gary, Ind. plant.

A comprehensive report has recently been issued by the National Association of Corrosion Engineers technical committee T-1J on oil field structural plastics, covering the performance of 73 different oil field installations of plastic tubing, from 2 to 4 in. in diameter, and including polyvinyl chloride, styrene-acrylonitrile copolymer and cellulose acetate butyrate formulas. A total of 110,000 lineal feet was involved; 24 installations experienced failure, of which 18 were due to excessive pressure or temperature. The committee concluded that the manufacturers should adopt quality control and pressure tests to eliminate weak pipe sections, and should develop stress-strain-time curves at different temperature levels in water to determine the long-term strength of the plastic materials; and that the user should use long-term strength data for installation design, together with an appropriate safety factor, and should install suitable control facilities to avoid excessive temperatures and pressures. This report is published in the September 1954 issue of NACE's *Corrosion* magazine, and its study is recommended to anyone interested in the engineering aspects of plastic tubing.

One of the latest developments is plastic "foam," which it is claimed will largely supplant sponge rubber for many uses. It can be made soft enough for a powder puff or hard enough to be used as an abrasive. With suitable base material the foams are said to be self-extinguishing when exposed to flame; not subject to oxidizing or rotting, nor affected by oils, greases or solvents; mothproof and verminproof and non-allergic to the skin; and will not support fungus growth. One of the suggested uses is for temperature and noise insulation.

In the field of education it is now possible to obtain a college degree in plastics, as Lowell (Mass.) Technological Institute is now offering a full four-year course in plastics engineering, with the background of what will assertedly be one of the most modern plastics fabrication laboratories in the country.

Molecular sieves

Linde Air Products Co. has recently released some interesting information on a group of new adsorbents developed in a search for new drying agents. These adsorbents are actually synthetic zeolites (sodium or calcium aluminum silicates) heated to drive off the water of crystallization. The resultant mass contains myriads of uniform molecular sized cavities interconnected with smaller cavities also of uniform size, to form a structure which can separate components of a mixture of gases or liquids, by a combination of sieve-like straining, and adsorption.

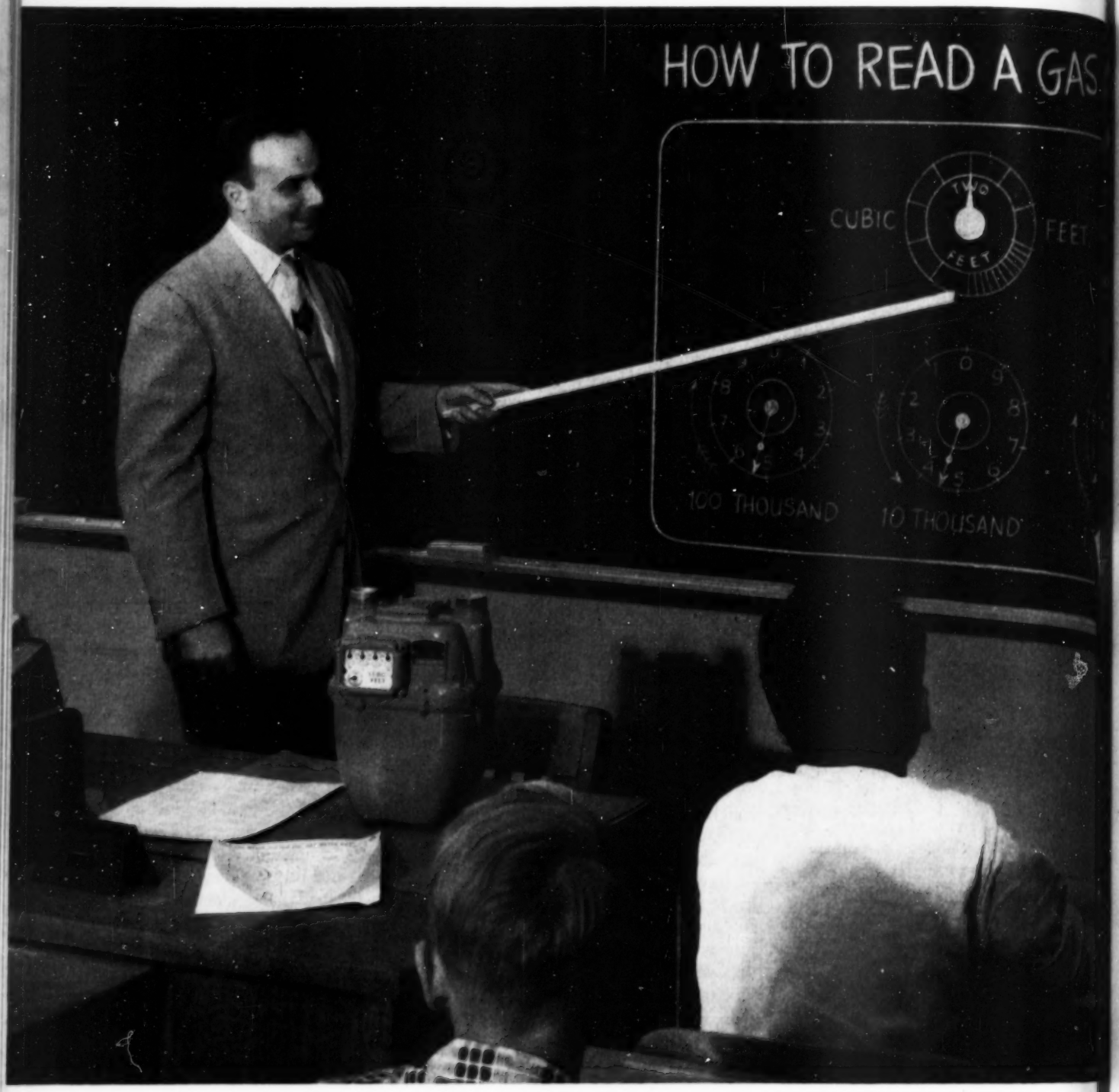
Two grades are now available, 4A and 5A, with smallest pores of a diameter of 4 and 5 angstroms respectively.*

Both grades can be obtained as powder, or 1/16- or ⅛-in. diameter extruded rods, at $1.95 per lb. In a gas or liquid mixture, containing molecules both small enough and too large to enter the smallest pores, the small molecules will be retained and the large ones rejected. The retained material can subsequently be removed by heating. Separation of components with very close boiling points (heretofore difficult by distillation) can be readily accomplished if the molecules are of different size, shape or polarity. The material is effective even at high temperatures and with components at very low concentration.

The potentialities of these molecular sieves are as yet relatively unexplored, but they may have numerous applications in the gas industry, such as in the removal of even trace quantities of sulfur compounds. They are excellent dehydrating agents, Grade 4A assertedly removing 19% of its own weight of water from a gas having a relative humidity of only 2%, even at temperatures as high as 200° F. For desorption or reactivation, they will withstand heating to red heat.

* Four angstroms is approximately sixteen-billionths of an inch.

The Gas Meter



Are You Taking Full Advantage Of All These Educational

"Natural Gas—science behind your burner." A kit consisting of a strip film tracing gas progress from well to burner; a teacher's text; two wall charts; hand out sheets for students, etc.

"Experiments With Gas." An illustrated text book designed primarily for Junior High School students. Contains 29 experiments.

"Advanced Experiments With Gas." For Senior High School and Junior College students. Contains 22 classroom experiments.

"All About Modern Home Laundering." An authoritative guide covering appliance equipment, fibers and fabrics, laundering methods, the laundry location, layout, etc.

"History of Gas." A 16 page story book in color showing the history of gas through the ages with "Miss Flame."

"Johnny Takes A Journey." A 17 minute sound-slide film for use at 6th, 7th grade teaching level.

"Story of Gas." Contains 36 pages of general information on gas, its history, production, utilization, etc.

GAS

FEBRUARY 1955

In Findlay, Ohio, the analogue computer pointed the way to the addition of a tremendous potential heating load increase

Columbia Gas solves a distribution problem with a network analyzer

By E. J. ESCOLAS and H. B. WOODWARD
Columbia Gas System Service Corp., Columbus, Ohio

ENGINEERS of the Columbia Gas System, now equipped with a McIlroy pipeline network analyzer, can quickly solve pipeline network distribution problems such as the analysis they conducted of the Findlay, Ohio, system last spring.

This typical situation illustrates how the analyzer may be used to determine the effects of a large potential load increase brought on by a backlogged househeating demand which suddenly could be fulfilled by making use of newly available gas supplies. The affected area was a segment of the system approximately 1 mile long and ¾ mile wide in downtown Findlay. The potential included applications on file for heating from 156 customers, with loads ranging from 50 cfh to 35,000 cfh; 17 of these loads exceeded 400 cfh.

Pipeline conditions

The McIlroy analyzer* makes use of analogous electrical circuits to simulate actual pipeline conditions. Electric current is analogous to pipeline gas

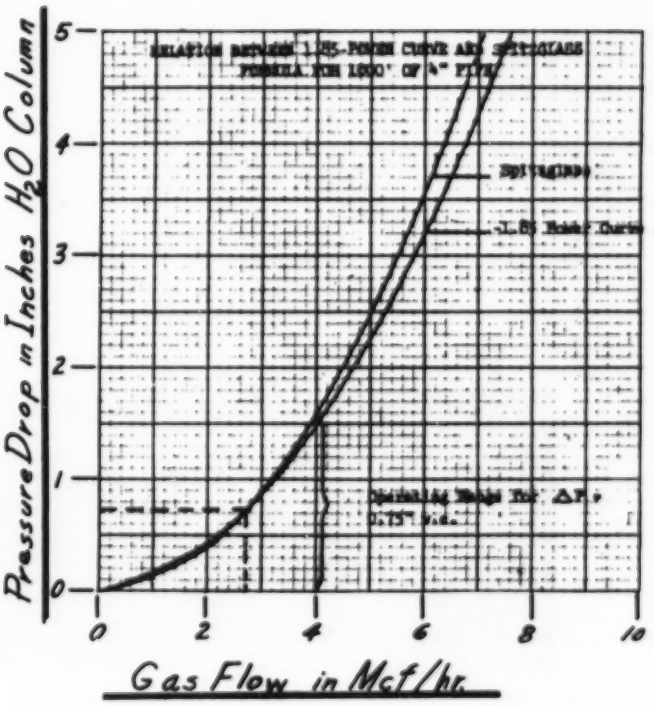
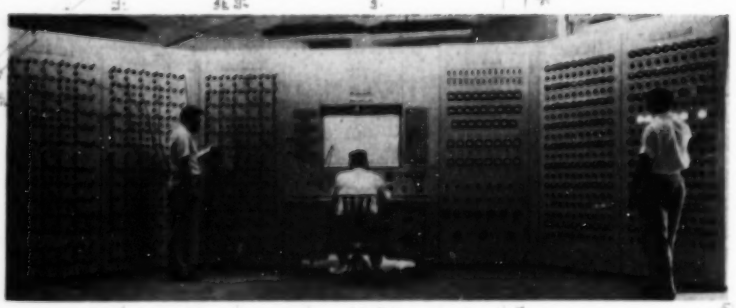


Fig. 1. Spitzglass vs. 1.85-power curve, shows the two curves equated to intersect at an average pressure drop of 0.75 in. w.c. per 1000 ft. The two curves approximate each other over a significant operating range; and, within this range, the errors tend to compensate for one another. Flow rates beyond this range can be corrected to give identical pressure drops with the Spitzglass formula by changing the point of intersection between the two curves.

*See "Laclede's New Network Analyzer Starts Attacking Distribution Layout Problems" by Frank Chapman, GAS, August 1953, p. 27.

GAS exclusive

RELATIONSHIP OF THE AREA ANALYZED TO THE ENTIRE FINDLAY SYSTEM



This is the network analyzer which was used by Columbia Gas to solve the Findlay problem.

flow, and voltage drop along a resistor is analogous to pressure drop in a pipe.

Similarity in the volt-ampere characteristic of a resistor and the pressure drop-flow function of gas in a pipeline is obtained by using special non-linear resistors called Fluistors, whose voltage drops vary as the 1.85-power of the current through them.

The Spitzglass formula standardized throughout the Columbia Gas System for low-pressure distribution studies can be equated to the 1.85-power curve to intersect at an average pressure drop per unit of length so that the two curves are nearly identical over a significant operating range of gas flows. Flow rates beyond this range can be corrected to give identical pressure drops with the Spitzglass formula (see *Fig. 1*).

The physical relationship of the segment of the Findlay system that was analyzed to the entire network is graphically shown in the map on page 46. The segment studied included six district regulators, 224 pipe sections, and 152 loads; and as will be shown later, as a result of the study, 80 ft of 12-in., 226 ft of 10-in., and 266 ft of 6-in. pipe was laid, while 70 ft of 8-in., 324 ft of 6-in., and 147 ft of 3-in. pipe was retired.

For some 46 years previous to this analysis, the Central Ohio Light & Power Co. furnished hot water heating for commercial and residential customers in the business district of Findlay. By 1952, operation and maintenance of this "City Heat" plant was no longer economical and abandonment action was felt to be in the best interests of the heating customers and the company. After a hearing the public utilities commission of Ohio granted permission to discontinue the City Heat system at the end of the heating season in May 1954.

Additional load

Before this hearing, in 1952, the city of Findlay had requested that the Ohio Fuel Gas Co., a subsidiary of Columbia Gas System, make a survey of the City Heat customers. At that time, it seemed improbable that Ohio Fuel's Findlay distribution system would be able to assume the additional load. However, applications were placed on file with the company for those City Heat customers who desired gas for heating; and these were to be approved as supplies and facilities permitted.

By 1954 the gas supply outlook in

Network analyzer ... Low pressure distribution network was prepared for analysis

Ohio had improved so much that most of the restrictions on gas for heating had been lifted. The Ohio Fuel Gas Co. was then faced with a tremendous potential increase in load for the 1954-55 heating season in the segment previously referred to, including the applications on file for heating from the 156 customers, including those of City Heat.

To determine the effects of this potential load increase, the low pressure distribution network of downtown Findlay was prepared for analysis on the Columbia Gas System's McIlroy pipeline network analyzer.

From this analysis the following de-

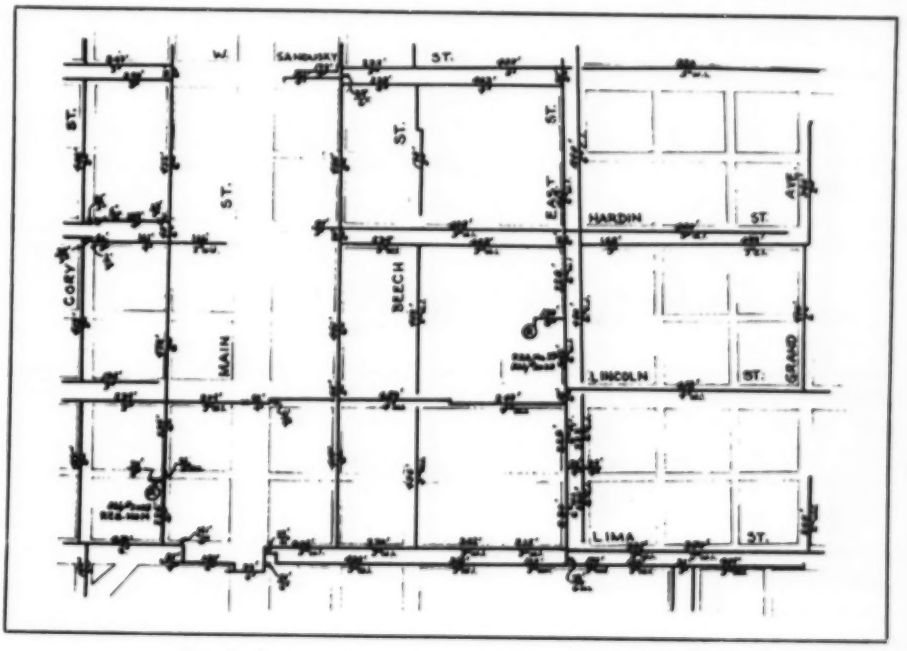


Fig. 2. Section from inventory map of Findlay, Ohio.

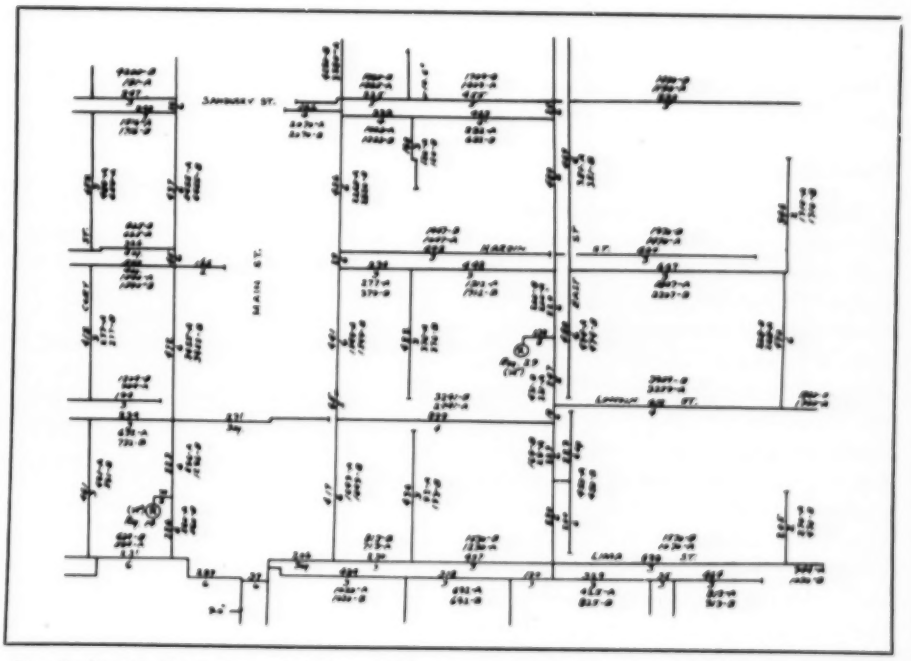


Fig. 3. Section from one of the load data maps completed by the distribution engineer in the Findlay area. The loads marked "A" are for the maximum hourly rates (Mcf/hr) in 1953 plus all heating requirements; those marked "B" are for the estimated maximum hourly rates for ultimate loading. Note the district regulator and given field pressures.

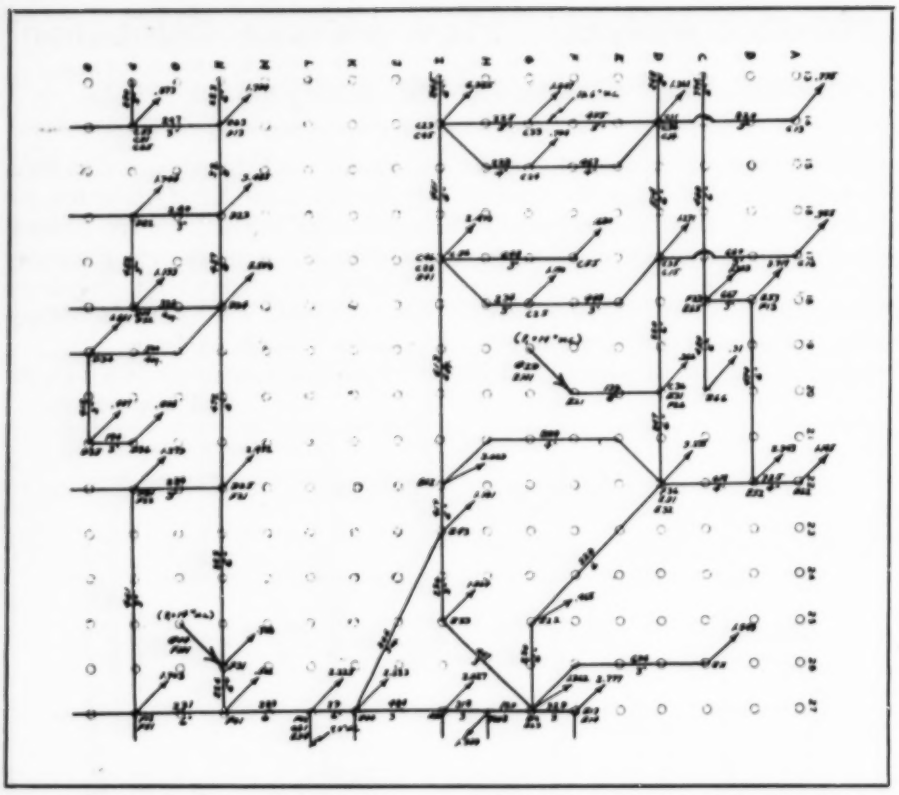


Fig. 4. Section from the schematic line map of the pipeline network of Findlay showing the loading marked "A", broken down into component parts. The coordinates at the pipe junctions identify the placing of the non-linear resistors (Fluistors) into the analyzer network section. Multiple coordinates at any single junction signify a common point.

terminations had to be made:

1. Improvements required to handle former City Heat customers.
2. Improvements required for other approved heating applications in the area.
3. Improvements to meet ultimate load.

(Ultimate load is considered to be 100% heating saturation, plus base load in an area.)

Operating level

As outlined under Columbia's standard policy for analyzer operation, the selection and request for an analysis originates at the operating level. This request, together with pertinent information, is forwarded to the general office engineering and planning section, where the necessary processing of data into analyzer form is completed. The problem is then turned over to the analyzer staff, Columbia Gas System Service Corp., for solution. (The solution is a closely coordinated process between the operating level group, general office engineering and planning, and the analyzer department.)

After the downtown area of Findlay had been approved by group engineering and planning for analysis study, the necessary inventory maps (see *Fig. 2*) were secured from civil engineering and load data maps (see *Fig. 3*) were constructed from them. The load data maps were then sent to John Pickens, distribution engineer in the Findlay area, to have the loads entered on each pipe section.

Information tabulated

The following information was tabulated by Mr. Pickens and returned to the group engineering and planning section of general office:

1. Maximum hourly loads for January 1953 by pipe section.
   a. Residential customers
   b. Commercial customers (large volume)
   c. Present City Heat customers (radiation required converted to maximum hourly gas load)
   d. Potential future heating loads for whole area.
2. Pressure data on lowest temperature day in January 1953.
   a. Regulator outlet settings
   b. Known line pressures recorded in field[1]

[1] A comparison between existing conditions in the field and simulated conditions from an analysis study will confirm the validity of load distribution.

HAVE YOU CONSIDERED THE ECONOMIES OF ANALOGUE COMPUTATIONS?

As the distribution man reads this article, he should take note of the extent of the system that was analyzed and make his own estimate of how long his own engineers would have to work on a problem of this size to produce the same results. It should be remembered that the complete analysis of the Findlay distribution plant involved the following computations:

(1) Present system with present loading.
(2) Improved present system with present loading.
(3) Improved present system with all approved heating customers.
(4) Improved present system with an estimated ultimate loading.

Each final analysis for the four preceding phases was the culmination of several alternative courses of system improvement based on the given conditions. As each successive phase was incorporated into the whole, previous recommendations were checked for stability and augmented by new plant improvements. He should ask his distribution engineers, (1) if their investigations would be as complete and include as many ramifications by the usual cut-and-try method, and (2) how many man-hours would be expended in such a complete analysis.

The time required for a conventional "hand" analysis should be compared with the following breakdown of time required for the Findlay analysis using an analogue computer:

	Man-hours
(1) Gathering field data	48
(2) Preparing schematics	8
(3) Preparing for analyzer set-up	3.5
(4) Making load and Fluister calculations	5.5
(5) Setting up and balancing analyzer	8
(6) Conducting analysis	54
a. Machine hours ..... 48 man-hours	
b. Improvement calculations ..... 6 man-hours	
Total man-hours	127

Network analyzer ... A schematic line map of the pipeline network was drawn

At the group level a schematic line map of the pipeline network was drawn. Loading from the load data maps was broken down into component parts and placed at pipe junctions and terminals (see *Fig. 4*).

To simulate distributed loading in a loop system along any pipe section, 50% of the load is placed at each end of the pipe. The total component parts are then added for each pipe section having a common junction to give the total load at the common junction. For dead-end lines, 65% of the load is placed at the end of the pipe and 35% at its junction.[2] Large volume loads were placed at the actual point of take-off on the pipeline network.

All pipe sizes and lengths were placed on the individual pipe sections for further preparation of the problem. Pipe sections containing more than one pipe size were converted into equivalent lengths and used as such in the basic calculations.

District regulators were identified and their pressures on the coldest day of the year were noted. Low pressure areas were marked as such.

From the schematic line map layout, an electric circuit diagram to simulate the pipeline network on the analyzer was made and coordinates of the analyzer network Fluistor sockets placed on the line map at the proper pipe junctions, i.e., every pipe section's resistance to flow can be represented by a non-linear resistor or Fluistor (see *Fig. 5*).

Calculation sheets were completed assigning current to represent load consumption and voltage drop for pressure loss. Using these conversion factors, Fluistor coefficients were calculated and

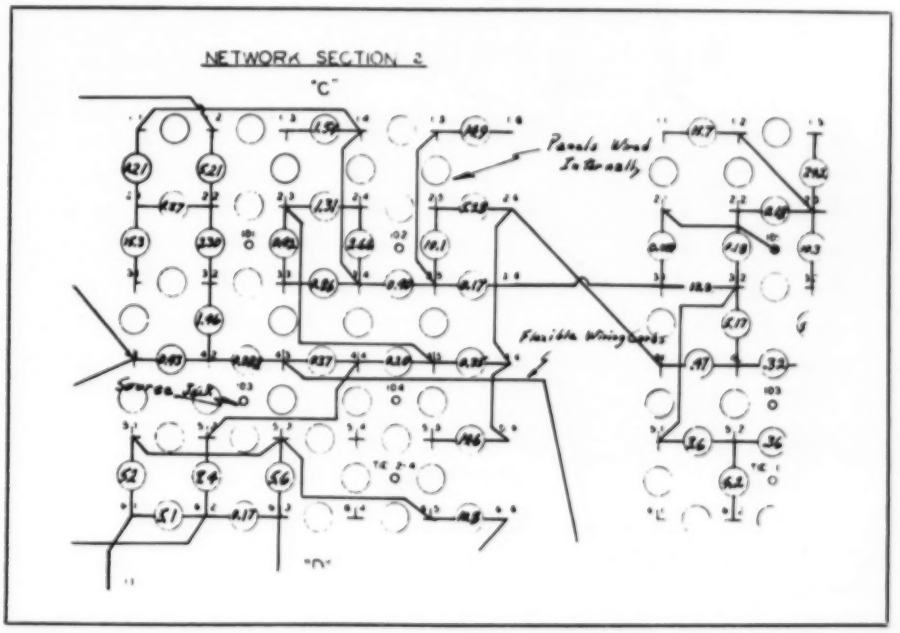
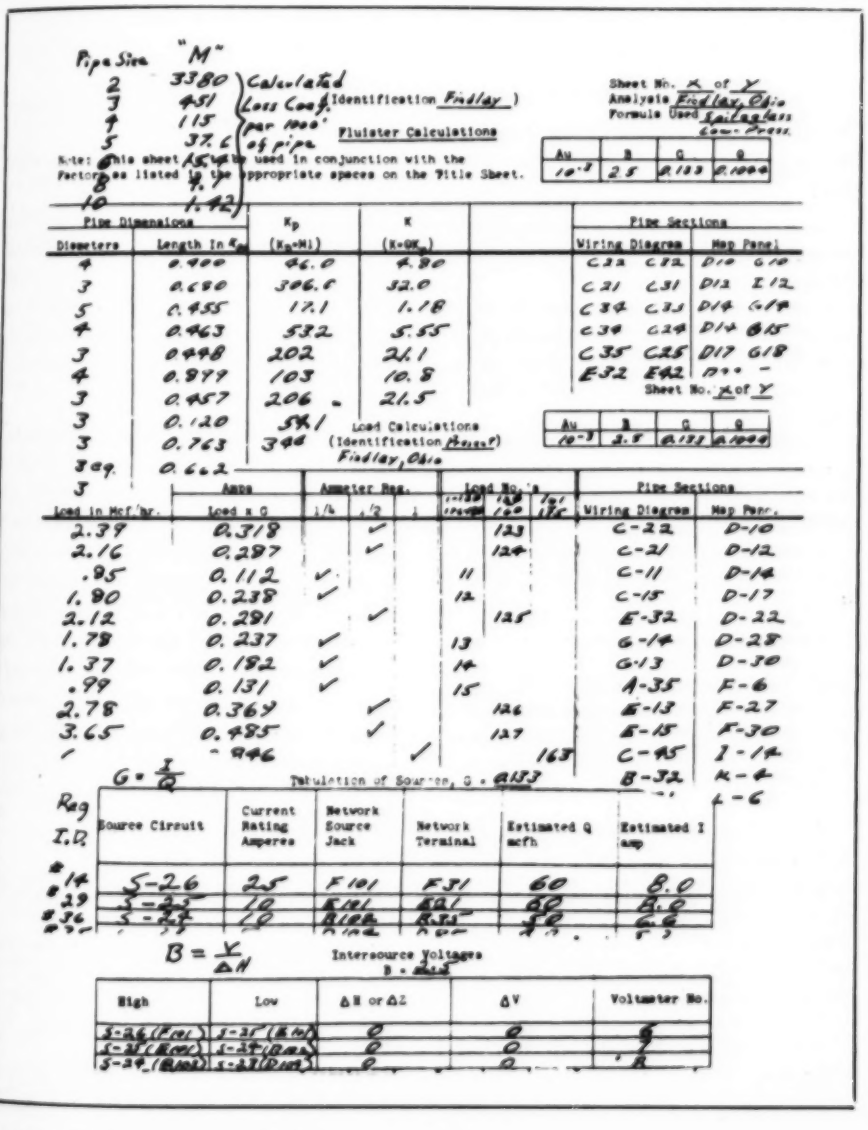


Fig. 5 (above). Section from wiring diagram of network sections showing the assigning of Fluistor sockets for pipe sections. The value placed inside the Fluistor circle represents the pipeline loss-coefficient (K).

Fig. 6 (below). The calculations necessary in making the glas flow-electric current analogy; Fluistor calculations determine the pipeline loss-coefficient (K) for each pipe section; load calculations determine the amount of current to be taken from the junctions; and the source sheets determine where and at what voltage differential the current will enter the system.



[2]This has been found from experience to approximate results closer to equal distribution of the total gas entering at the junction of the average dead-end line.

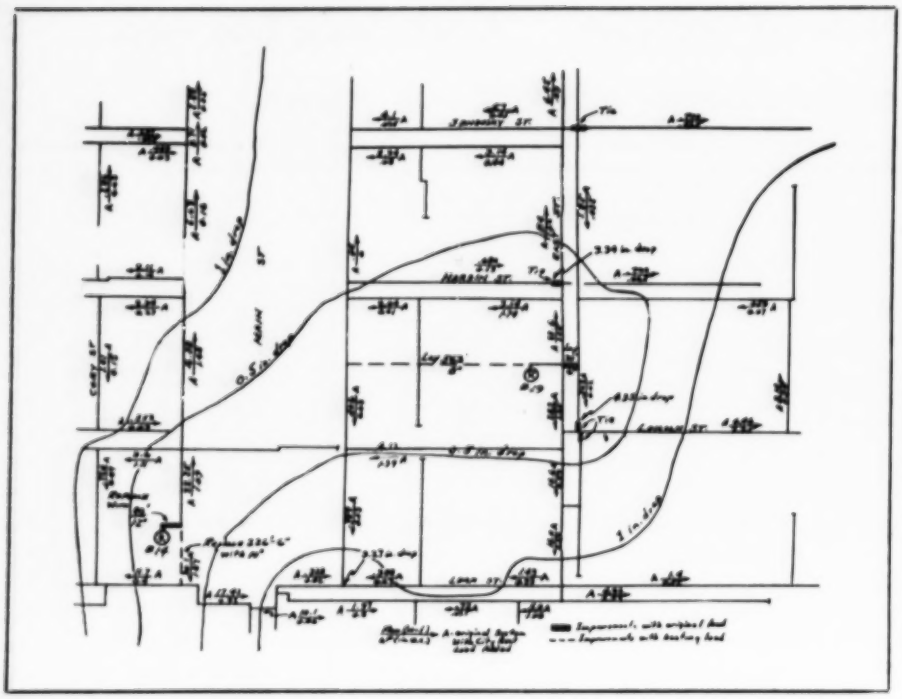


Fig. 7. Composite section of several answer maps taken from the Findlay analysis. The individual flows and pressure drops are for the original system, plus the City Heat customers. The heavy solid lines show improvements needed for present loading. The dashed lines are improvements needed to supply all approved heating customers with gas plus estimated ultimate loading. The pressure drop contour lines are for the improved system under ultimate loading.

their values placed on the electric circuit diagram.

The preparation for an analysis was concluded by assigning current sources to represent the district regulators. Outlet pressure settings at the district regulators were simulated by introducing voltage differentials between the current sources (see *Fig. 6*). This completed the analogy—provisions had been made to supply current, distribute it through a simulated pipeline network, and dissipate it at various points throughout the system

Next the problem was turned over to the analyzer department for solution guidance and set-up on the analyzer.

The following procedure was used in placing the Findlay data on the analyzer:

a. Temporary flexible cord connections were inserted as required by the electric circuit plan.

b. Fluistors and selectors were mounted, i.e., Fluistors whose "K" (resistance) coefficient would represent a particular pipe resistance to flow were placed in their respective sockets.

c. Ammeters were set, using current control rheostats, in loading circuits to simulate load take-off previously determined.

d. Individual load take-offs were connected to proper pipeline network junctions.

e. Current sources (district regulator stations) were connected to proper pipeline terminals in network section.

After the analyzer was energized, a solution was obtained simply by reading the master instruments on the control section. The flow in each pipe section was read directly from the master ammeter by means of a demountable scale placed over the face of the ammeter. Pressure drop was read directly by means of a demountable scale placed over the face of the voltmeter.[3] The polarity of the voltage drop and direction of current flow determined the direction of gas flow. Balance checks were made for possible errors following completed readings around any loop. These were made by having the flows into a junction equal those leaving and having the algebraic sum of the pressure drops around the loop equal zero.[4]

The Findlay analysis study consisted of four separate solutions:

a. Present system with present loading.

b. Present improved system with present loading plus City Heat customers.

c. Improved present system with all approved heating customers.

d. Improved present system with an estimated ultimate loading.

The answers to each analysis were recorded on answer maps (see *Fig. 7*) for reference and study to show possible modifications to improve the network system.[5] As a result of the analysis 80 ft of 12-in., 226 ft of 10-in., 1088 ft of 8-in., and 266 ft of 6-in. pipe was laid; 70 ft of 8-in., 324 ft of 6-in., and 147 ft of 3-in. was retired.

The final solution was the result of integrated planning from three perspectives: field engineering, with its knowledge concerning the physical factors of the distribution plant in question; group engineering and planning, with its knowledge of company policy pursuant to plant improvement and its experience regarding the probable effects of various types of system modifications; and analyzer engineering, providing the specialized technical personnel to set up the analogy and operate the analyzer. ∎

Mr. Escolas is an engineer in the distribution department of the Columbia Gas System Service Corp. and heads the analyzer section. He has been working for Columbia since July 1953, following his graduation in mechanical engineering from Northeastern University.

E. J. Escolas

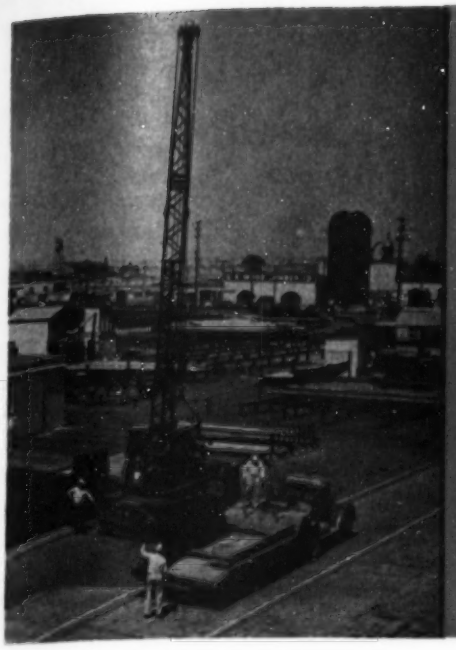
H. B. Woodward

Mr. Woodward is a general engineer, utilization, and was recently assigned as the McIlroy analyzer coordinator for Ohio Fuel Gas Co., a Columbia subsidiary. He began working as a cadet engineer for the engineering and planning section of Ohio Fuel in 1949, following his graduation in electrical engineering from Ohio State University.

[3]Demountable scales are calibrated masks that allow current and voltage drop to be read directly as gas flow or pressure drop.

[4]A more complete explanation of the theory and operation of the McIlroy pipeline network analyzer is available through an American Gas Association publication entitled, "Gas Pipe Networks Analyzed by Direct-Reading Electric Analogue Computer," Malcolm S. McIlroy, Cornell University, Ithaca, New York. (DMC-52-10).

[5]Any possible modification to an existing system can be inserted rapidly and its effects noted. Those deemed worthy are incorporated in the final solution.



PIPE YARD DESIGN

Part 4 in a series on materials handling, which covers general layout considerations as well as available equipment.

GAS staff report

By **J. FRED EBDON** · Managing Editor

PIPE is the prime material used by the gas industry—it enables the basic product to be marketed and it represents the major dollar investment. Most pipe has a high bulk density; therefore, the tonnage handled each year in a pipeyard is large enough to convince anyone that much time and money can be saved by the application of efficient methods for handling and storing this basic item. Also, the value of pipe is usually increased by the application of protective coatings for corrosion mitigation. The huge investment represented by the coating and wrapping operations must be protected by proper handling and storage techniques.

Location

The availability of common carriers removes pipe from its static condition created by its unit weight and places this commodity in the dynamic state, so pipeyards must be located where railroad lines or spurs and switching facilities can be effective. Access by large semi-trailers and other trucks must also be considered, so there is the need for locating the pipeyard near, if not on, major traffic arteries. Obstructions, both man-made and natural, should be at a minimum. Large, flat, well drained areas are obviously ideal, but may be hard to find in specific geographical locations. Industrial areas should be chosen because noise, unsightly conditions, and, in the yards where hot-applied coating is done, unpleasant smoke and fumes may result in the course of normal operations.

Layout

Service roads within the premises should be laid out on a time-vs.-distance basis. The flow of traffic will be most efficient if it is planned to be as nearly circular as possible. Flow will affect neatness in the operations, so any possible measures that will tend to prevent the yard from disentegrating into a semi-junk yard should be kept in mind.

The pipeyard office and checking stations must be located to facilitate maximum control of pick-ups, deliveries, and intra-yard traffic. Roads should be wide enough and designed for sufficient loadings to permit cranes, prime movers, and trucks to operate efficiently without damage to themselves or the facility (see *Fig. 1*). Recessed gates have been used effectively to solve the problem of ingress and egress in relation to busy traffic arteries. Remember, streets that are not heavily traveled at the time of construction may become busy thoroughfares as the economy of a particular area advances

Pipe of the sizes most used, usually 6 in. and under, should be located closer to the major shipping and receiving points than the little-used sizes. Also, it is well to store the small, fast-moving pipe close to the coating and wrapping equipment, if such facilities are in the yard.

Experience should first prove that a planned layout is ideal before fixed laydowns are installed. Until that time, portable, temporary pipe laydowns should be used. In any case, the pipe laydowns used should be designed to effect a movement of the pipe stock on a last-in-last-out program.

Some professional storage people advocate the spotting of pipe laydowns parallel in relation to the internal service roads; others prefer a perpendicular pattern. Careful study will reveal which is best suited in a specific instance; however, modern trends in the gas industry are toward the use of perpendicular stacks for pipe 6 in. in diameter and larger, for ease of handling. Pipe smaller than 6-in. diameter is generally laid down in stacks parallel to roadways because there is a problem of bulk handling with these sizes.

Other design elements that the engi-

Pipeyard design ... Efficiency can be increased if a communication system is installed

neer planning the pipeyard layout should not overlook are these:

(1) Natural obstacles that might affect operations.

(2) Consideration of possible night operations, now or in the future.

(3) The elimination of overhead power lines or other services to be installed that will interfere with crane operations.

(4) Present or probable future need for railroad switching facilities inside the yard in large operations.

(5) The need for adequate, hard-surfaced roads and areas with proper drainage facilities. It will often be necessary to move pipe during or after periods of inclement weather, and pipeyards are liable to become quagmires during wet weather unless measures are taken to assure at least partial operation then.

(6) The types of materials handling equipment that will be used in the normal operation of the pipeyard.

Facilities

The general concept of a pipe storage area envisions a wide open space with little or no added equipment or facilities; however, economics in dollars, time, and manpower can be achieved by the addition of certain devices.

Many companies have found that the installation of scales in their yards has reduced costs and allowed more accurate accounting. A volume operation can usually justify this expense. Installation of a scale should enter into the original design of the flow-plan *(Fig. 2)*. The flow of pipe from the coating and wrapping machines, to trucks, to the scales, should be as short and in as straight a line as possible.

Bins and concrete working aprons should be provided for handling bulk materials. In addition, it is well to make provisions for storage space for copper pipe and other items that will require a little more security and protection from the elements. A locked pipe rack, such as the one shown on *Fig. 3*, has worked out well.

Efficiency can be increased if a communications system is installed in a pipeyard to relay orders, answer questions, summon personnel for phone calls, etc. Because of the distances encountered, considerable time will be saved with a rapid communications medium. The system can be as elaborate or simple as desired. Receiving and sending equipment should be located at strategic points according to a preconceived plan.

Many different types of pipe laydowns have been used in gas industry pipeyards. Several companies will use nothing but sand-lined laydowns. Most companies have gone to the use of wooden or concrete skids. It is well to use skids or laydowns that offer a great deal of flexibility, as pipe lengths are often random and the storage requirements in respect to pipe sizes, lengths, etc., may be changed frequently. Again, fixed pipe laydowns should not be used until their design and location has been proved by operating experience with temporary types.

Flexibility

A commercially available high-load skid design is shown in *Fig. 4*. This model consists of railroad rail, cut to length, and precast concrete supports with anchor bolts cast in place. To assemble a skid, the supports are spaced at desired intervals, and then the rail is simply bolted to the supports and anchored with special rail clips. The flexibility of these skids is obvious—they can be quickly disassembled and moved together or farther apart, or relocated to fit conditions.

Any object in a pipeyard that will contact treated and wrapped portions of any piping should be padded to prevent damage to the coatings. With hundreds of thousands of dollars being spent every year to produce continuous protective coatings, it is good business to spend some money on protective pads and lining for equipment that will be used to handle such pipe. Too often, field forces in the gas industry do not treat these costly pipe coatings with respect due them. Treated and wrapped

Fig. 1. Loading small diameter pipe with the aid of a 20-ton Lorain mobile crane. The Southern California Gas Co., which does its own pipe coating, has three coating machines and can process pipe up to 30-in. diameter.

Fig. 2. View of pipeyard maintained in Los Angeles by SoCal. Note the mobile crane in the background and the truck on the weighing scales at the extreme right. Traffic lanes are clearly marked.

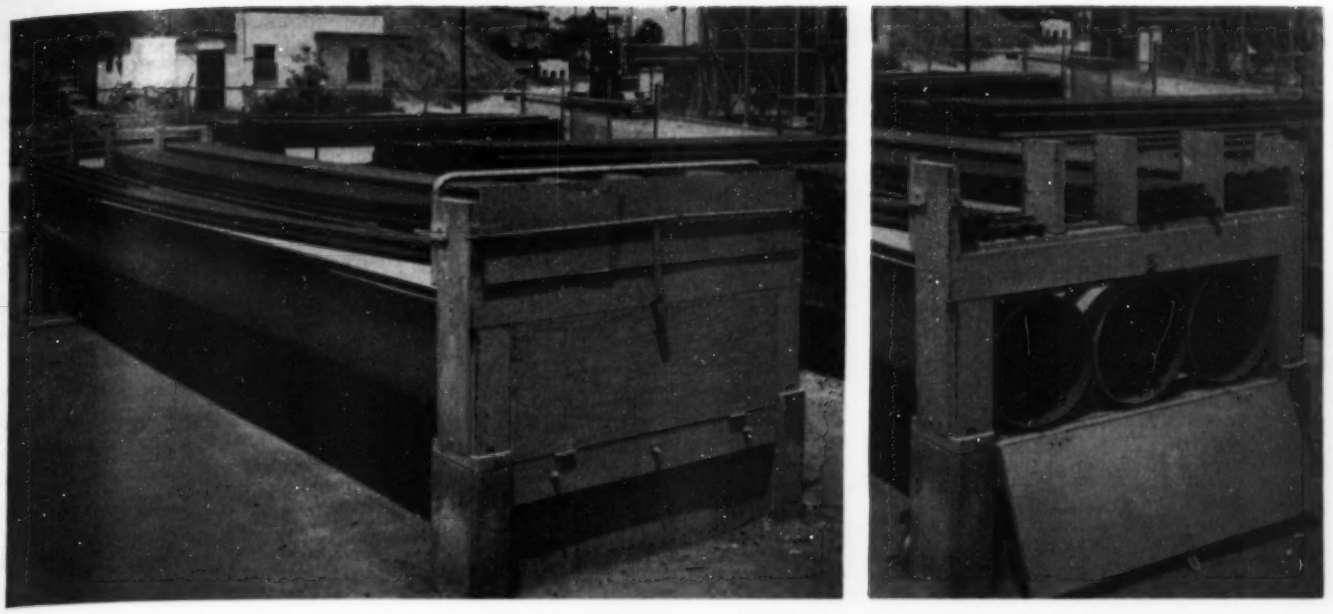


Fig. 3. Locked pipe rack is used by Southern Counties Gas Co. for storage of pipe that requires special security or protection from the elements. View at left shows the rack in its locked position. At right the rack is unlocked for the removal of pipe.

pipe should be stacked where there is as little danger from moving vehicles, etc., as possible. Nesting coated pipe is not advisable as long storage, in this manner, will cause some plastic flow of the coatings where the weight is carried on underlying joints.

Pipe handling equipment

The rapid advances in the development of materials handling techniques, spurred by rising costs of hand labor, have produced a number of pipe lifting and moving devices. A careful study should be made to select equipment that suits the requirements of a company's operating policies. The cost of such equipment is usually high, but the resultant efficiency will save a huge amount of money in the long run.

Fork lifts are now available with attachments that enable them to handle pipe readily.* They can be purchased with power plants using any of several kinds of fuels. Their range and traveling speeds should be determined when it is desired to use them in large pipeyards. Also, care should be taken to select those that have the stability and load carrying capacity needed for handling pipe.

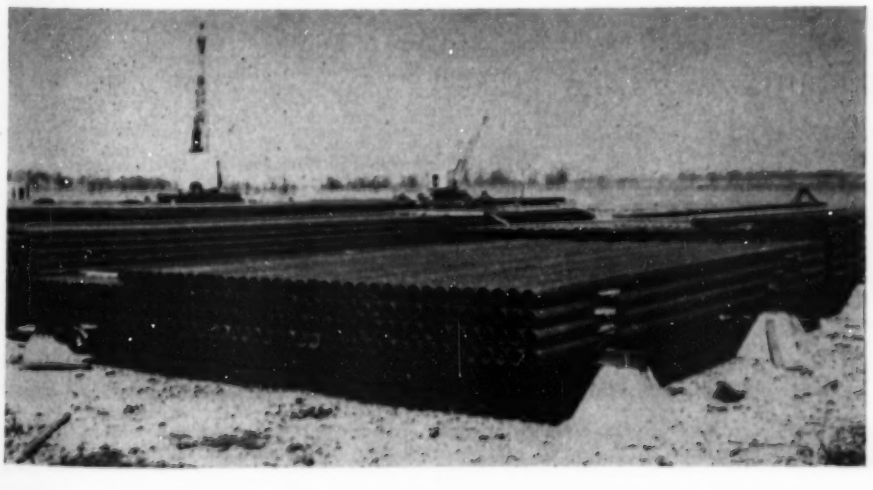
There are many cranes that are suitable for pipeyard use. The self-propelled, truck mounted cranes have been used in pipeyards to good advantage (see *Fig. 5*). Some have a hydraulically operated boom extension feature and are operated with hydraulic controls—these are particularly well suited to large-scale pipe handling operations. Their mobility in the yard and on public roads is a distinct advantage. Also, side-boom equipped trucks and tractors have been an industry standard for some time and will do a good job.

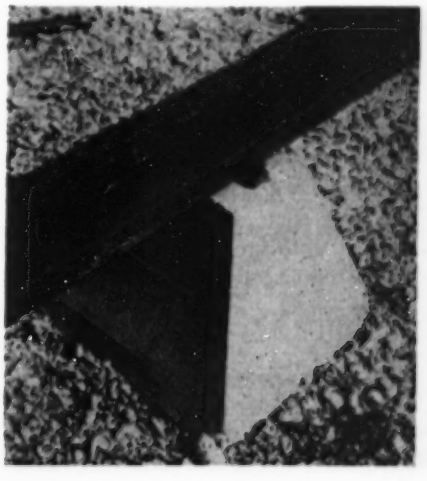
*See "Fork Lift Truck" by Frank Chapman, GAS, July 1954, p. 48.

Straddle type carriers

The success of the straddle-type carriers in the lumber industry and in dock-side stevedoring bears looking into for pipeyard use. These efficient

Fig. 4. Pipe storage skids can be disassembled and moved to suit various pipe lengths. Their flexibility and neatness produce efficient storage for pipe.





Pipeyard design ... Activities must be closely controlled and coordinated

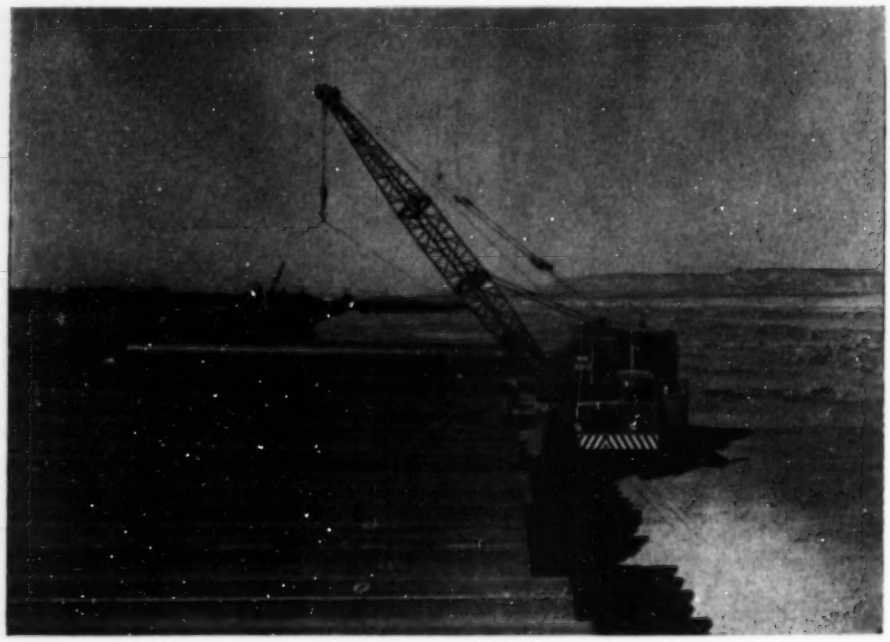


Fig. 5. This Bucyrus-Erie mobile crane, equipped with 40-ft boom, is handling 30-in. welded steel pipe weighing approximately 2 tons per length for the El Paso Natural Gas Co.

carriers can be designed for use with pipe and seem to be a method that has not been thoroughly explored.

Some pipeyards have had excellent success with the overhead cranes *(Fig. 6)*. A gantry crane, for instance, can be mounted on a trackway that straddles the main pipe storage laydowns and railway facilities. This device can then be used for several combinations of pipe receipt, shipment, or trans-shipment plans.

The final evaluation of the types and numbers of fork lifts, cranes, trucks, etc., depends on the physical limits of the pipeyard and the volume of pipe handled per unit time, so general recommendations would not be particularly helpful. It should suffice to say that there are many different types of pipe handling machines on the market that have been efficiently used by various gas companies. Investigation will reveal the combination best for a particular yard.

Pipeyard operational factors

The question of company-owned vs. contracted or jobbed coating and wrapping facilities will always be present when a pipeyard is being planned. We cannot say here which is the best for a particular company; however, it is significant that there is a trend toward the use of the contract system because this is a specialized operation and the original cost of good equipment seems to limit its application to the large gas companies. In any case, coating equipment will not produce economies unless a company is able to process pipe in economical quantities. This machine cannot be shut down on a sporadic basis to accommodate small runs of different pipe sizes and to vary coating specifications.

Pipeyard activities must be closely controlled and coordinated. Too many trucks in a yard trying to do too many jobs at the same time usually produce confusion and cause a loss of time as some generally have to wait for instructions or equipment and labor. Contractors' and common carriers' trucks should be scheduled for loading or unloading in the pipeyard at a time other than when the gas company's trucks are loading and unloading. Also, tallying and reporting crews should be coordinated with materials handling crews to produce economies.

Several gas companies are investigating the use of magnetized pipe handling equipment to determine the advantages and disadvantages of this method in relation to conventional slings and clamps. Large loading crews are certainly an expensive work force and perhaps this or other methods can be used to reduce the size of pipe-handling crews.

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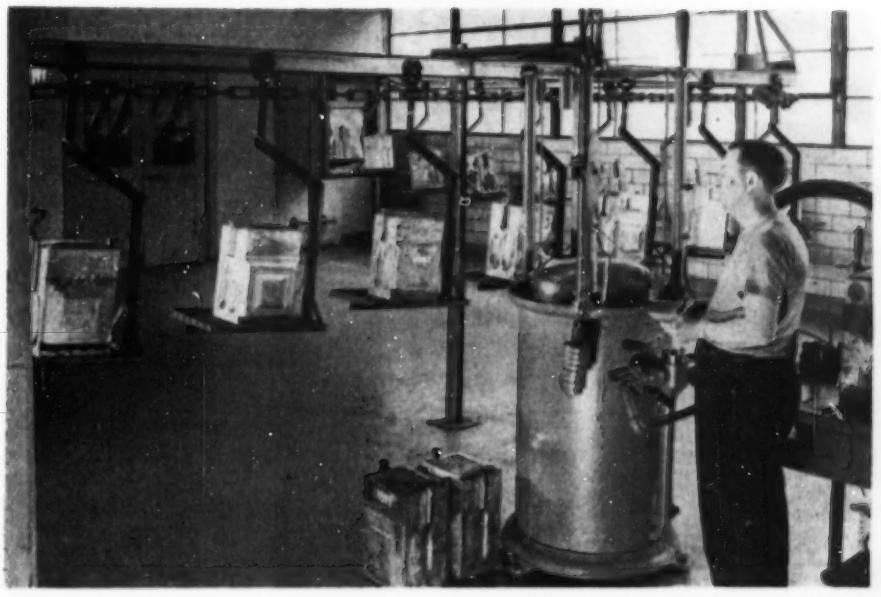
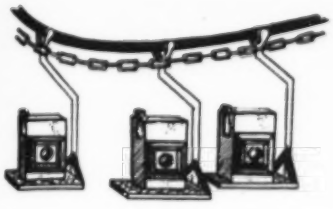
Fig. 6. Overhead traveling lifts being used to handle pipe in Southern Counties pipe coating operations.



Tinned steelcase gas meters at Equitable are shown on their way to the washing and degreasing cabinet from proving room after in-test operations.



Trolley-conveyor system reduces meter repair costs

UNTIL recently, meters coming into the Equitable Gas Co.'s meter repair shop were moved by hand with the aid of hand carts. This time-proven method served them well for a number of years, but with the advent of increased labor costs coupled with expansion of their distribution properties, the need for improved handling facilities was increasingly evident. A new meter shop equipped with an overhead-trolley conveyor system has filled the need for greater repair shop capacity and has reduced unit cost for repaired meters.

The utility serves more than 235,000 customers of all classifications and is adding to these consumers at the rate of 2000 per year. This has been the trend for recent years, and it is anticipated that this increase will continue.

The accuracy of Equitable's meters must be proved every eight years, in the case of domestic classification, and the commercial and industrial classifications must be tested every five and two years, depending on meter capacity. These rules are promulgated by the Pennsylvania Public Utility Commission and mean that about 30,000 meters must be pulled and tested for accuracy each year. Also, the Equitable people feel that this practice protects their income because revenue is actually based on the ability of the meters to accurately measure the volume delivered.

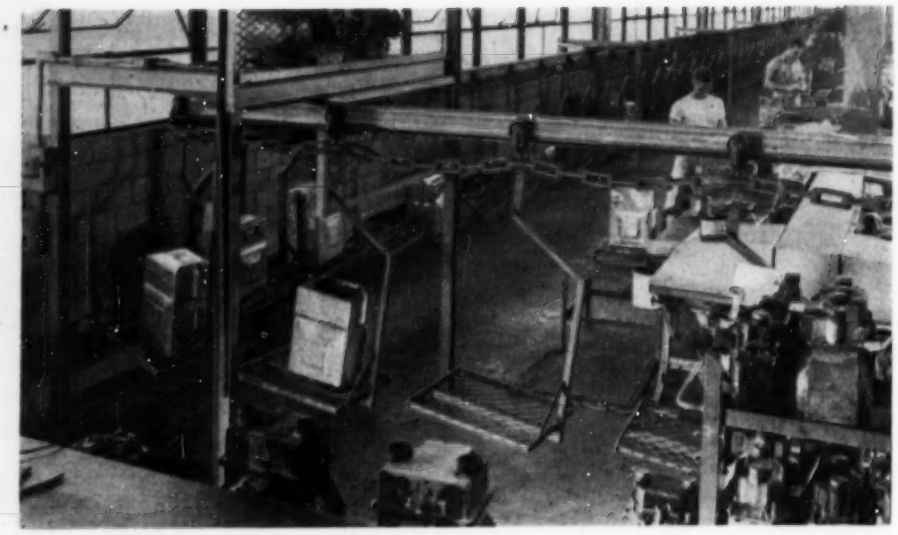
At least 29 different sizes and types of positive displacement meters are found in the system. In the domestic group, there are iron-cases, aluminum alloy-case, and tinned steelcased meters. This variety of measuring devices complicates any handling system.

All of these conditions pointed up the need for increased capacity in the meter repair operations. The logical solution was to (1) enlarge the working area, and (2) install improved meter handling methods so that the flow through the shop could be accelerated. To accomplish the enlarged area plan, a new two-story building on the south side of Pittsburgh was leased. This building was constructed to their specifications. A Link-Belt No. 458 overhead-trolley conveyor system was designed and installed to speed the passage of meters through the shop and reduce the labor costs involved with their movement.

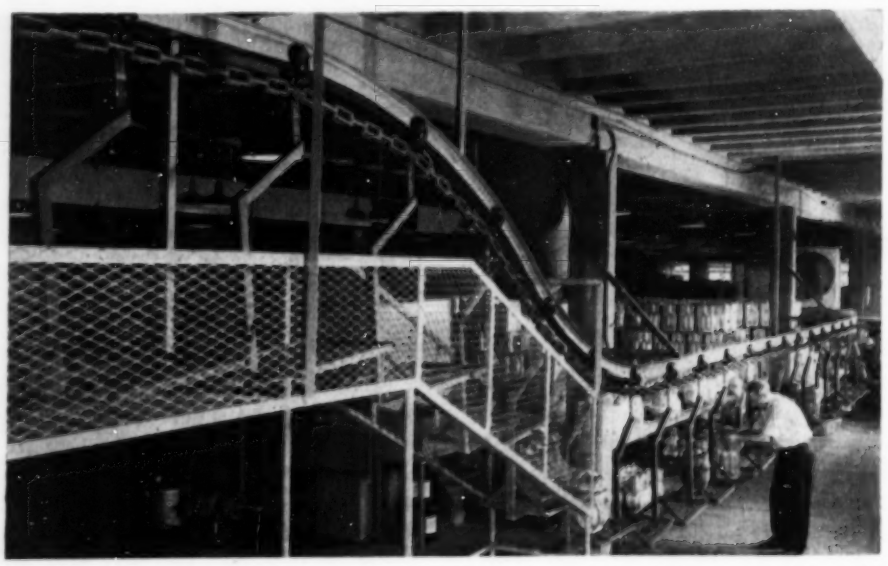
Meters are classified and stored on the first floor of the shop. All the meter testing and maintenance operations are performed on the second floor. Some second-floor space has been allocated to the required offices. The offices and the meter proving room have been air conditioned so that temperature and relative humidity can be closely controlled; thus, accuracy of the testing devices and the tests is increased. Meters are moved into the proving room and stored there for at least 24 hours so that the meters' temperatures, and the temperature of the proving room and the air in the bell provers, is equalized, and consistent testing conditions are assured the year around.

From the proving room, tested meters are placed on the carriers of the conveyor system and travel out of that room and through a wash cabinet. The wash cabinet prepares the surfaces for repainting by stripping them of dirt, grease, and old paint. Then, the meters are rinsed with hot water. The speed of the conveyor can be varied to permit different speeds through the wash cabinet. This is necessary because some meters must be subjected to these processes longer than others. The wire mesh

This article has been adapted from "Link-Belt News," published by Link-Belt Co., Chicago.

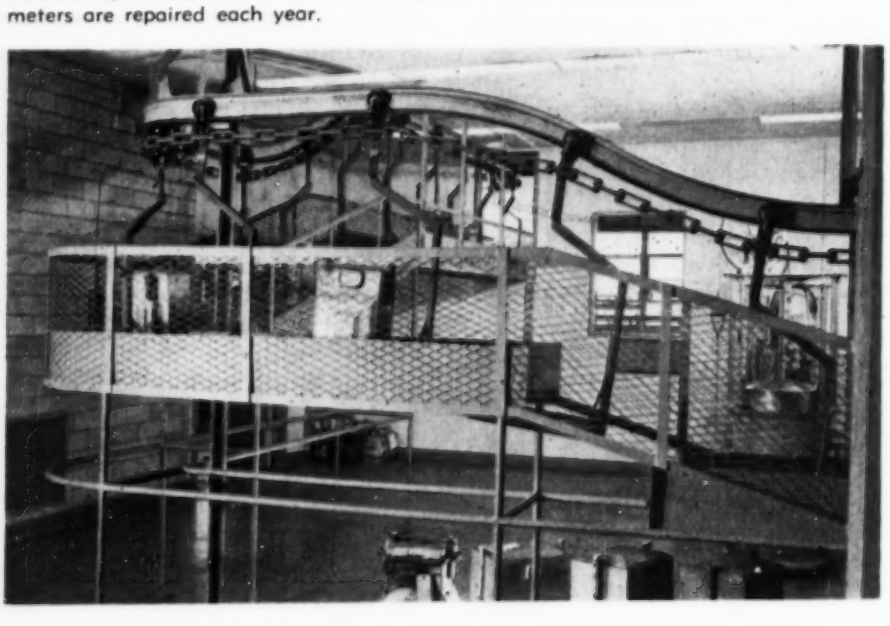


At the repair station after the meters are washed and the tops have been removed, exposing internal mechanisms, necessary repairs and adjustments are made.



All sizes and styles of meters are placed on the trolley conveyor after repair. Here the conveyor is shown on the way back to the proving room.

The trolley conveyor enters the proving room with repaired meters. About 30,000 meters are repaired each year.



bottoms on the carriers allow the sprayed fluids to contact the entire bottom surface of the meters as they pass through the cabinet at speeds varying from 1 to 3 ft an hour (20 to 60 meters per hour).

Meters leaving the wash cabinets are automatically conveyed to the top-removing station. There, the valves are timed and other necessary repairs or adjustments are made. From that point, the meters are carried to the various repair stations. At each station, the repairman takes meters from the conveyor, performs the necessary repair done at his station, and then replaces the meters on the conveyor. The whole shop is set up on a production-line basis, so each meter receives the repair it requires as reflected by the proof record and visual inspection.

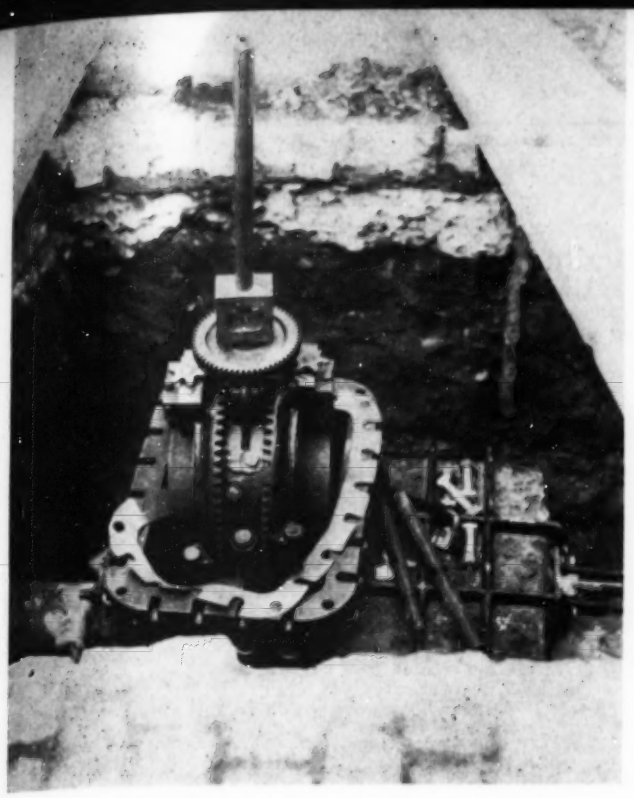
After all repairs have been completed, the conveyor returns the meters to the proving room and their temperatures are allowed to equalize. Then they are proved again to ascertain that they are measuring within the limits required by law. The completed meters are then repainted and stored for use as needed.

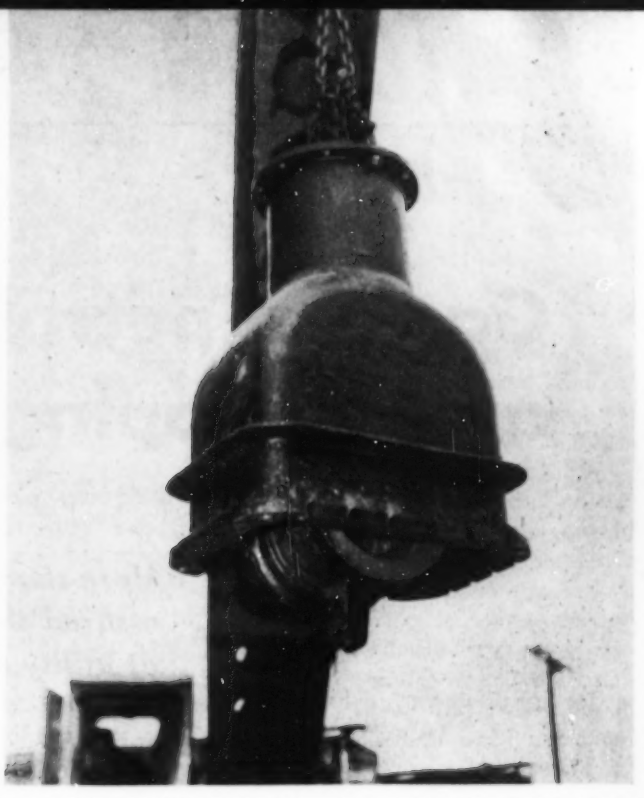
Shop capacity increased

Equitable Gas has found that the efficiency of this type of trolley conveyor system has increased the meter shop capacity and reduced unit cost. The entire unit was carefully designed and laid out so that maximum usable floor space was retained for working area. The conveyor is arranged in an L-shaped path and is about 130 ft long by 40 ft wide. An 80-ft extension can be added to it should it ever be necessary to increase the meter repair area.

The carriers are designed to carry all of the sizes and types of meters used by Equitable. Where the conveyor passes near windows, the supports were lowered so that there is minimum interference with natural lighting; it is elevated at aisles and passageways so that personnel can pass unhindered beneath. The overhead sections use ceiling area —wasted in conventional shops.

M. M. Pears, manager of the Equitable Gas Co.'s planning and development department, did the design work for the working area, and supervised the installation and initial operation of the conveyor. He was assisted in this work by O. K. Hays, meter shop supervisor, and J. H. Conn, foreman of meter repair personnel.





Cutting machine is shown (left) installed on an operating gas main. Note the casing that encloses the slide valve. When the slide valve is closed, the cutting machine and the pipe cut-out can be drawn up into a dome that is normally bolted to the exposed flange shown. The inserting machine dome (at right), with the special gate valve attached, is shown being lowered to the flange of the lower part of the inserting equipment. No gas blows during the entire operation.

Inserting a gas valve in an existing line under pressure

THE Philadelphia Gas Works division of the United Gas Improvement Co. has successfully applied valve inserting equipment long used in waterworks operations to the task of inserting valves in low and medium pressure mains without killing the line or constructing bypasses. Gas is not allowed to blow at any time during the installations.

The equipment can be used for inserting valves in cast iron or steel pipe against any operating pressure up to 100 psig. Valve sizes 4-in. to 20-in., inclusive, can be inserted in a vertical position; from sizes 24-in. to 48-in., inclusive, the valves must be inserted in a horizontal position. Special iron-body, bronze-mounted, gate valves are normally used for the insertion; however, special all iron inserting valves can be supplied if the characteristics of the gas being distributed warrant their use, and cast steel inserting valves can be produced to order for use in high pressure transmission lines.

Philadelphia Gas Works' first application of the equipment, made a year ago, was in the installation of a valve in an 8-in. low pressure gas main.

The first step was the affixing of a double-headed cutting mechanism to the pipe at the exact point where the valve was to be installed. A pinion shaft was rotated until the cutting machine had cut the pipe about half-way through. An inserting machine was then bolted to the pipe, completely enclosing the cutting mechanism. The joints between the pipe and the machine were sealed by leading and caulking to produce gas-tight joints. Following tests that indicated the joints were gas-tight, the cutting machine was activated again and the section of pipe between the two cutting heads was cut through.

The cutting machine, with the cut-out section of pipe, was then raised into the dome. The sliding valve in the inserting machine was closed, the dome removed, and the cutting machine taken out along with the removed section.

A special valve replaced the cutting machine in the dome of the inserting machine. The dome was then replaced on the inserting machine, and the sliding valve opened. After the special valve was lowered into position, internal devices centered the valve on the pipe ends and made the compressed rubber pressure tight joints. The inserting machine was removed so that the joints at both ends of the valve and the internally applied sleeve joint could be leaded and caulked. The job was completed with the installation of a rubber type joint-clamp at each poured and caulked lead joint.

A completed gas valve insertion job. Customer's gas supply was not affected during the installation operations.

This article is adapted from the *P.G.W. News*.

Gas and petroleum industries are developing industrial radio

More than a decade of organizational work has assured the future and operating efficiency of utility and petroleum radio service.

By JOSEPH E. KELLER, T. G. HUMPHREYS, and CLIFTON D. CAMPBELL

THE growth in industrial use of radio communications facilities has been one of the truly remarkable advances in the nation's recent history. Among the groups that have led the way in this development, none have been more prominent than the natural gas and petroleum industries. Both of these industries have shown true pioneering spirit and energy in attacking the roadblocks in the path of effective industrial use of radio.

The leaders in the petroleum and natural gas industries' progressive march toward increased use of the airwaves have been the committees set up by the oil industry and the utilities industries to deal with radio problems. The Central Committee on Radio Facilities of the American Petroleum Institute and the National Committee for Utilities Radio are the representatives of these two groups. Along with the central committee, much credit for the progress which has been made by petroleum radio users must also go to the National Petroleum Frequency Coordinating Association, which operates independently, but in cooperation with, the central committee. In the realm of microwave communications the newly formed Operational Fixed Microwave Council has assumed the position of an inter-service agency established to guide the growth of microwave communications facilities through cooperative efforts among the safety and special Radio Services licensees entitled to use the higher frequencies.

The Central Committee on Radio Facilities of the American Petroleum Institute is a committee within the American Petroleum Institute's Division of Transportation. The committee is charged with representing the members of the American Petroleum Institute in their radio matters at the administrative agency level only. The National Committee on Utilities Radio, on the other hand, is a national organization of public utilities companies using radio in their operations. In general, the central committee represents licensees in the "Petroleum Radio Service" while the National Committee on Utilities Radio represents licensees in the "Power Radio Service," but both services come under the general FCC heading of Industrial Radio Services.

The National Petroleum Radio Frequency Coordinating Association is the frequency-coordinating association for the Petroleum Radio Service, but in the Power Radio Service this job is one of the functions of the National Committee on Utilities Radio. A petroleum industry member who desires to receive a radio authorization will contact the regional headquarters for the area in which he is located (see *Fig. 1*) and will be advised as to which frequency in his area is least crowded. Thereafter he will prepare his FCC application form and request a formal frequency recommendation from the regional frequency coordinating office, supplying it with all the pertinent data concerning his proposed station. The regional office records this data, so that it has a continuing record of authorizations in its area for ready reference in making recommendations to other users, and then issues a formal letter of recommendation to the prospective applicant. This letter is then filed with the application and submitted to the Federal Communications Commission for action. The commission will not act on a Petroleum Radio Service application without a frequency recommendation from the National Petroleum Radio Frequency Coordinating Association.

About six months after the recommendation to a prospective applicant is formally made, the National Petroleum Radio Frequency Coordinating Association sends out a questionnaire to determine whether he has actually received a grant from the commission and is operating a station on the recom-

GAS exclusive

*Mr. Keller is special representative of the National Petroleum Radio Frequency Coordinating Association and of the central committee of radio facilities of the API. Mr. Campbell chairmans the Operational Fixed Microwave Council and Mr. Humphreys is secretary of the National Committee for Utilities Radio.

mended frequency. In this way, the National Petroleum Radio Frequency Coordinating Association has an accurate record of conditions in each region so that its recommendations can be made so as to lessen congestion as much as possible.

The National Committee on Utilities Radio handles frequency allocation and recommendation essentially the same way as the National Petroleum Radio Frequency Coordinating Association except that it operates with a total of 10 regions in the United States (see *Fig. 2*) instead of the seven regional organizations within the National Petroleum Radio Frequency Coordinating Association. The regional organizations of the National Committee on Utilities Radio vary in name somewhat, whereas the regional organizations of the National Petroleum Radio Frequency Coordinating Association are merely numbered Region 1, Region 2, etc.

The National Committee for Utilities Radio

Late in 1942, the Federal Communications Commission, recognizing that it would be faced with a multitude of frequency allocation problems when the war ended, asked the radio manufacturers and users to organize an advisory group to be known as the Radio Technical Planning Board. This board was organized in 1943 and consisted of various committees representing certain segments of the industry. Among these committees, Committee No. 4 of Panel 13 represented the utility radio users, Panel 13 covering broadly all land mobile service.

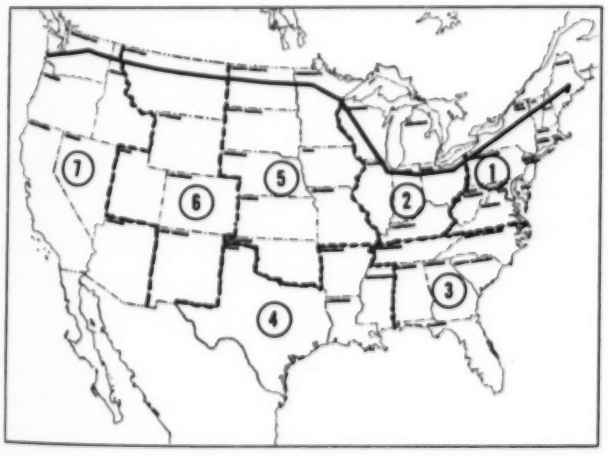
Committee No. 4, Panel 13, continued for a number of years to serve the electric, gas, water and steam utilities and succeeded in obtaining a number of exclusive channels for utility radio licenses. It was responsible for the adoption by the commission of operating rules which recognized the needs of utilities and made mobile radio the useful and versatile tool that it is today. There can be little doubt that the present widespread use of radio by all classes of power utilities is a direct result of the intensive and hard work of this early pioneering group. It should be noted that utilities' use of radio has been confined to emergencies falling in the category of the "special emergency" service prior to establishment of the "power" radio service in 1946.

The officers and members of Committee No. 4 recognized, quite early in their work, that it would be necessary, even with the substantial number of channels exclusively allocated for utility use, to have some orderly process for assigning frequencies to individual users in order to make full use of the available spectrum space. A committee was, therefore, appointed to study the matter and make recommendations. This committee, headed by George Underhill of the Central Hudson Gas and Electric Co. of Poughkeepsie, N. Y., reported some time later with a plan for geographic sharing of frequencies which considered long-distance transmission and other factors and minimized interferences, thus making it possible to assign a relatively large number of users in various parts of the country to the same frequency. This plan, which was to set the pattern for all mobile radio allocations, was then and is still known as the "Underhill Plan."

Committee No. 4 of Panel 13 was reorganized in 1948 as the National Committee for Utilities Radio and was to serve the interests, in all radio matters, of the so-called "power" utilities as distinguished from the communications common carriers. Membership of NCUR is composed of representatives from various trade associations, including the American Gas Association, and delegates from the 10 regional committees, which, themselves, consist of representatives from utility radio users in the area served. Each region and sponsoring trade association is permitted one vote regardless of the number of delegates that may be present. Leadership of NCUR has come from all of the classifications of users with the exception of the water and steam industry. Chairmen have been connected with gas utilities, private electric companies and electric cooperatives. T. G. Humphrey Jr. of Alabama Gas Corp. is secretary of the committee. Chairman and vice chairman are, respectively, D. G. Schreiner of Woodbury County Rural Electric Cooperative and R. W. Lewis, Boston Edison Co.

The Central Committee on Radio Facilities

When the Radio Technical Planning Board was organized in 1943, its ac-



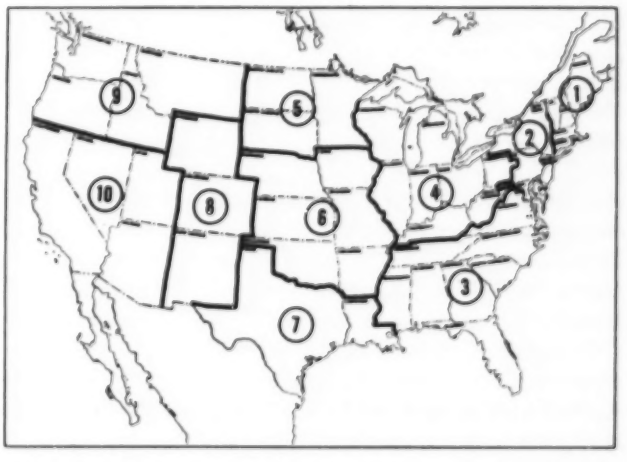


Fig. 1 (left). Jurisdictional boundaries of National Petroleum Radio Frequency Coordinating Association regional committee. **Fig. 2 (right).** Ten regions of the National Committee on Utilities Radio. They are: 1. Utilities Radio Association of the Northeast; 2. Middle Atlantic Utility Radio Association; 3. Southeast Utilities Radio Group; 4. Great Lakes Utilities Radio Committee; 5. Minnesota-Dakota Utilities Radio Committee; 6. Mid-Central Utilities Radio Committee; 7. Utilities Radio Coordinating Association of Texas and Louisiana; 8. Rocky Mountain Utilities Radio Association; 9. Northwest Utilities Radio Association; 10. Southwest Committee for Utilities-Radio.

Industrial radio ... Formation of a committee on natural gas use of radio contemplated

tivity received the serious attention of members of the Petroleum Industry Electrical Association, an organization composed principally of communications superintendents of most of the major oil and pipeline companies in the Midwest and Southwest.

Because these men were vitally interested in all methods of communications, particularly within and for the oil industry, they started a movement within the association to become affiliated with the Radio Technical Planning Board in order to further the petroleum industry's interest in obtaining useable frequencies for day-to-day operations.

As a result of their efforts, the Petroleum Industry Electrical Association became a contributing sponsor in the Radio Technical Planning Board, and the president of PIEA appointed a committee to formulate the oil and gas industries' radio requirements. This committeee became known as Committee No. 9, Provisional and Special Emergency Oil Industry Services, Panel 13, Radio Technical Planning Board. It prepared a very comprehensive statement outlining in minute detail the communication requirements of the two industries.

After the Radio Technical Planning Board went out of existence, the original PIEA committee became the petroleum industry's only representative group concerned with protecting its over-all stake in radio. Because of the fact that membership in this association could not, by any stretch of the imagination, be considered representative of the entire industry, steps were taken to interest the API in the formation of a radio committee that could encompass all phases of the industry's varied operations in a recognized association which would be truly representative of the industry as a whole.

These efforts crystallized in the formation of the Central Committee on Radio Facilities on April 23, 1947. The first permanent committee was appointed on Nov. 9, 1947 in Chicago.

The newly created committee immediately concerned itself with the most pressing problem, that of finalizing the establishment of the petroleum radio service.

Finally, on May 3, 1949, the FCC announced the adoption of its Industrial Radio Service Rules in final form to become effective July 1, 1949. Sub-part G of Part 2, "Rules Governing Industrial Radio Services," covers "Petroleum Radio Service."

Since the establishment of the Petroleum Radio Service, the volume of work performed by the Central Committee on Radio Facilities has increased and has been extended to cover all facets of the radio problems faced by the petroleum and gas pipeline industries. The central committee has been successful in establishing a friendly relationship between these two industries, the Federal Communications Commission and other government agencies performing vital national services.

The central committee represents about 98% of the radio licensees in the petroleum and gas pipeline industries. Within its organization it has a Committee on Radio and Engineering, a Committee on Radio Coordination, a Committee on Geophysical Use of Radio, a Committee on the Use of Radio in Oil Production, a Committee on Pipeline Use of Radio, a Committee on Maritime Use of Radio, and a Committee on Refinery Use of Radio.

It is now also contemplated that there will be formed a Committee on Natural Gas Use of Radio within the framework of the central committee. This new natural gas committee will be made up entirely of representatives of the communications committee of the American Gas Association and these representatives will guide the policy and activities of the central committee insofar as natural gas problems and decisions are involved. The Committee on Natural Gas Use of Radio will occupy the same position as an integral part of the central committeee as do the Committee on Geophysical Use of Radio, Production Use, etc.

The National Petroleum Radio Frequency Coordinating Association

The establishment of the National Petroleum Radio Frequency Coordinating Association has been one of the most important accomplishments of the radio users in the oil industry. After the establishment of the new Petroleum Radio Service in 1949, the problem of coordination of frequencies assigned to the service assumed paramount importance because of the great demand for frequencies and the relatively small number available.

The association had its beginnings as the temporary National Petroleum Radio Frequency Coordinating Committee, organized in Washington on May 16, 1949, primarily for the guidance of the petroleum and gas pipeline industries in coordinating frequencies for their mutual benefit.

The committee divided the United States into seven administrative regions (*Fig. 1*), and a temporary chairman was appointed for each region. These temporary chairmen were charged with the organizing of regional petroleum radio frequency coordinating associations.

At a national meeting, held June 13, 1949 in Kansas City, a thorough review was made of the Washington proposals, particularly with reference to the coordination of frequencies within the industry. Considerable thought was given to the protection of the industry's geophysical operations, and it was deemed advisable to designate certain frequencies for their exclusive use. A final plan and an assignment pattern were adopted by the assembly, which consisted of approximately 60 members representing all phases of the petroleum industry in the United States. Each regional chairman presented the views of the users from his region, and these were carefully considered in the deliberations of this body. Permanent officers of the new association were elected, and since that time the NPRFCA has continued to operate as an association independent of the API.

The present chairman of the national committeee of the NPRFCA is H. A. Rhodes of Transcontinental Gas Pipe Line Corp.

The Operational Fixed Microwave Council

The Operational Fixed Microwave Council, which during its developmental phases had been variously referred to as the Microwave Frequency Coordinating Association and the Microwave Users Council, became a reality in Houston on Sept. 29, 1954.

One of the key functions of the new Operational Fixed Microwave Council

Industrial radio ... Maximum utilization of the microwave spectrum sought through coordination

will be the job of advising and assisting the Federal Communications Commission in the drafting of rules to govern development of the microwave bands. Creation of the new council provides the convenient forum which is needed by the various organizations eligible to use the microwave frequencies for operational fixed communications needs, in order that technical information, mutual ideas, and common problems may be exchanged.

In brief, its objectives are to foster the mutual interests of organizations concerned with operation or use of operational fixed radio systems in the radio safety, industrial, land transportation, marine, and aviation radio services; to support and promote the allocation of microwave frequencies suitable for such uses; help member organizations to formulate and coordinate views on uniform standards, fair regulations, and beneficial technical developments; assemble and maintain data and disseminate pertinent allocation information.

The council's by-laws expressly provide that the operation, activities and actions of the council are to be "voluntary and advisory," and that the organization is not to act in a representative capacity for the members of the council individually.

Comprising the council are organizations, or members of organizations, who are eligible to use operational fixed radio systems and appoint accredited representatives to the council. Representing the petroleum industry, for example, is a designated member of the American Petroleum Institute-National Petroleum Radio Frequency Coordinating Association; and representing the power utility industry is a member of the National Committee for Utilities Radio. Each member organization is entitled to one voting member and a designated alternate.

Selected as chairman for a period of two years was Clifton D. Campbell of Humble Pipe Line Co., who represents the American Petroleum Institute.

Background and development

Years before the Operational Fixed Microwave Council became a reality, a great many of the various groups interested in the microwave frequencies had been aware of the growing problem in this field. At the June 1952 annual meeting of the National Petroleum Radio Frequency Coordinating Association, the chairman of that group appointed a committee to study the problem of microwave frequency coordination, and to report at the next meeting. Consideration and study of the problem prompted this committee to state, in June 1953, that no successful plan of microwave frequency coordination could be administered effectively by NPRFCA alone, since microwave frequencies available to the petroleum industry are shared by all other users in the Industrial Radio Service. The committeee therefore recommended that other interested organizations such as the National Committee on Utilities Radio and the Association of American Railroads, be contacted with an eye toward forming such an industry-wide coordination council. The recommendation was accepted by the NPRFCA membership.

Tentative plans

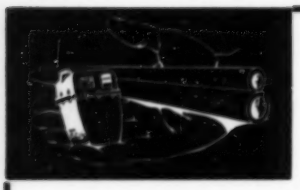
The organizational groundwork, carried on in conjunction with NPRFCA, NCUR, and AAR, eventually brought forth a tentative plan designed to provide the type of coordination that would enable all users in the Industrial Radio Service to participate. This plan was later approved by FCC, and a steering committee was set up, under the chairmanship of C. D. Campbell of the NPRFCA, to contact all users in the Industrial Radio Service who had not already been contacted in order that they might be advised of the plan and to lay the groundwork for an organizational meeting which would bring together interested groups to discuss the common problem of microwave coordination and control.

During this same period of time, the Federal Communications Commission, recognizing the need for some degree of standardization in the microwave frequencies, issued a Notice of Proposed Rule-Making in Docket No. 10500 on May 13, 1953, which would have amended its rules regarding operational fixed stations operating on frequencies above 890 megacycles. Among the comments filed in this docket were those of API's Central Committee on Radio Facilities, which declared that an immediate need existed for a sufficiently high degree of standardization in these bands to permit the removal of the developmental classification, which, it held, could be accomplished only through the adoption of a complete set of Microwave Service Rules, rather than the rule-making proposed under Docket No. 10500, which contemplated microwave rules that set forth only minimum standards. The proposal in Docket No. 10500 was withdrawn by the commission on Oct. 29, 1953, on the ground that it appeared desirable to defer action until a complete set of microwave rules could be adopted.

Studies continuing

While the plans for a coordinating council composed of various users in the Industrial Radio Service went forward, continuing studies were being conducted by individual groups. At the AIEE fall general meeting in Kansas City, Mo., on Nov. 4, 1953, Victor J. Nexon, vice president of Microwave Services, Inc., brought attention to the need for industry coordination in order to obtain maximum utilization of the microwave spectrum. He cited the already prevalent signs of interference, the lack of any coordination program set up to administer in the interest of all users, and the huge potential realizable through the use of microwave, which has been frequently referred to as the "last frontier" of unused spectrum space. He concluded that coordination solutions on a beam-wide basis, together with frequency and band width, should be found to provide interference-free operation for a maximum number of microwave systems in the various areas. Mr. Nexon's study, as well as those of other interested individuals pointed to the need for an organization such as the Operational Fixed Microwave Council.

With the organizational meeting of industry groups interested in private microwave systems already in the offing, the FCC directed a letter on Feb. 3, 1954 to the Central Committee on Radio Facilities of the American Petroleum Institute, and to the Radio Electronics Television Manufacturers Association, requesting that they furnish the com-



SHORT CUTS IN MATERIALS HANDLING: **7**

Metal storage frames

Peoples Gas Light & Coke Co., Chicago, uses Mult-A-Frames for the storage of various brick shapes and other material in order to use the cubic content of the storage room. Here, the frames, made of metal tubing, are shown being assembled (bottom left), holding tires (right), and being used for general storage (above).

AGA Materials Handling Subcommittee

mission with information in connection with the drafting of proposed Microwave Rules and Standards. The job of assimilating and preparing the requested information and data is still being pursued by these two groups.

On February 24, 1954 the organizational meeting of the contemplated Microwave Council was held in Chicago. By this time, the name of the proposed organization had been changed from the Microwave Frequency Coordinating Association to the Microwave Users Council. The chief of the Safety and Special Radio Services Bureau of the FCC, Col. Ed White, was on hand to assure the group of the commission's continued interest in the formation of the proposed council, and to reiterate the need for a policy in the handling of microwave frequencies.

A draft of proposed by-laws for the council, presented by the special representatives of API, was tentatively adopted, subject to final approval at the forthcoming meeting in September 1954. The proposed rule making under Dockets Nos. 10500, 10797 and 10821 relative to proposed standards and rules which would affect the microwave services, were discussed; Mr. Campbell and the other acting officials were formally nominated and elected to fill the same posts in the permanent organization.

At a council meeting at Houston, last September, amended by-laws were approved, and the council was finally established. Its new name—The Operational Fixed Microwave Council.

Official approval of the by-laws of the council has already been given by the NCUR, the API's central committee, NPRFCA, and associations and groups representing state highway officials, railroad communications, manufacturers, the forestry conservation communications, bus communications, national forest industries communications, as well as the Special Industrial Radio Service Association and the American Trucking Association. Tentative executive approval has come from the Associated Police Communications Officials Inc. It is expected that the American Waterways Operators, who has the matter under consideration, will officially approve the by-laws and formally enter the council in the very near future.

With a majority having already approved the by-laws, the Operational Fixed Microwave Council is presently duly constituted to proceed with its objectives as a full-fledged organization and plans are progressing toward the establishment of a microwave informational exchange service whereby microwave users will report all of the vital data concerning their systems so that it might be plotted on council maps. It is the feeling of all of the members of the Operational Fixed Microwave Council—and, unofficially, of the commission—that the establishment of this council represents a most significant and constructive step toward the successful plotting and efficient utilization of that "last frontier" of unused spectrum space—the microwave frequencies.

GAS selected bibliographies

5. Compressors and compressor stations

This is the fifth in a series of selected listings of articles that have appeared in GAS over the past 30 years, covering a broad variety of subjects of particular interest to the gas engineer.

1927

Clean Oil Essential to Efficient Compressor Plant Operation, T. C. Wallace, *Mar., p. 27.*
Gas Engines and Compressors, (Part I), J. W. Reed, *June, p. 30.*
Gas Engines and Compressors, (Part II), J. W. Reed, *July, p. 46.*
Dehydration of Gas by Compression, H. M. Barnes, *Dec., p. 28.*

1928

Compressor Plant Design and Operation, Elting Henderson, *Jan., p. 22.*
Practical Use of the Indicator in Gas Compressor and Gas Engine Work, (Part I), Elting Henderson, *May, p. 52.*
Practical Use of the Indicator in Gas Compressor and Gas Engine Work, (Part II), Elting Henderson, *Aug., p. 23.*

1929

Compressor Station Personnel the Vital Factor in Efficiency, Byron L. Rogers, *May, p. 65.*

1930

Bureau of Standards Apparatus and Method for Determining Compressibility of Gas, H. S. Bean, *Feb., p. 45.*
Largest Compressor Plant Begins Service in Louisiana, W. E. Nestor, *Mar., p. 31.*
Designing a Modern Compressor Station, Fred Doyle, *May, p. 72.*

1931

The Pickens Compressor Station, Charles W. Merriam, *Mar., p. 28.*
Abilene and Calista Compressor Stations, D. L. Sedgwick, *June, p. 33.*
Compressor Station Construction, 1930-1931, *July, p. 35.*
Compressor Plant Problems, S. S. Donaldson, *Aug. p. 74.*

1932

New Trends in Compressor Station Design, Clinton B. Brown, *Mar., p. 24.*
Compressor Plants, Grove Laurence, *Aug., p. 123.*

1933

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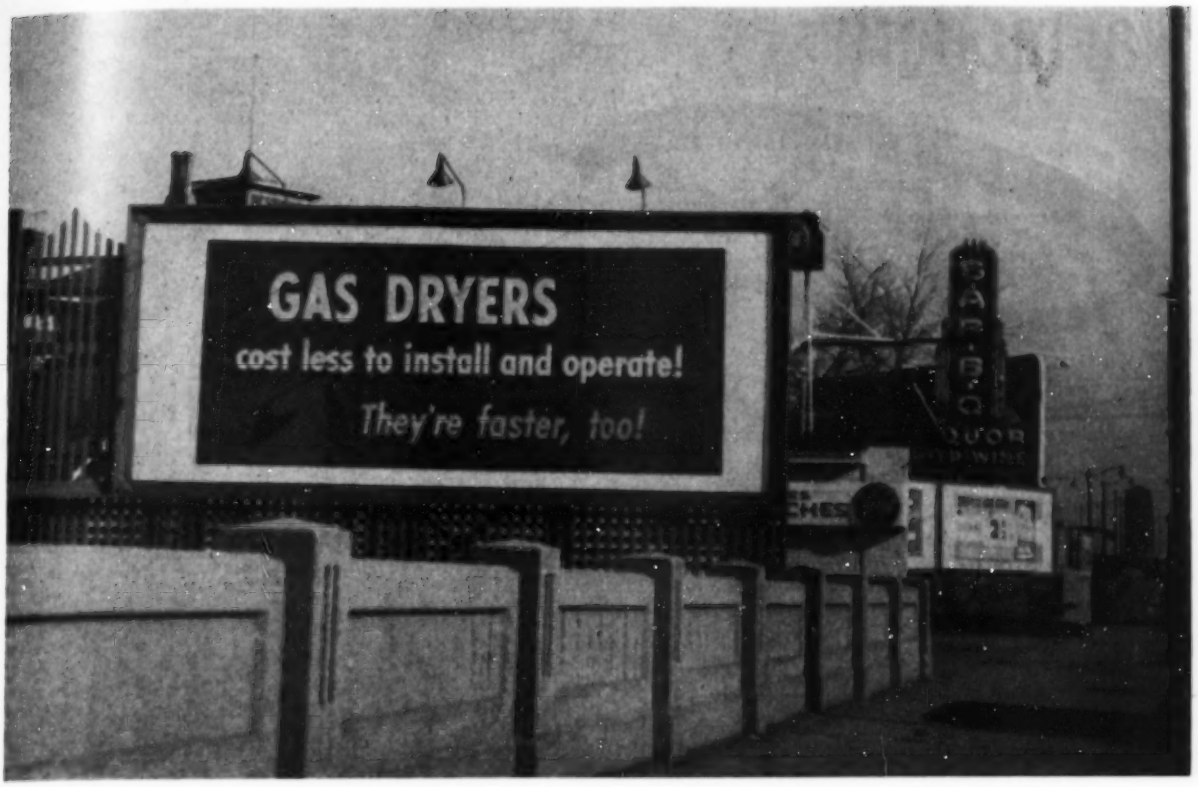


Billboards like this were used in the five-city Ohio area.

Contest brings big increase in East Ohio's clothes dryer sales

Backed by an all-media ad campaign, appliance salesmen moved 2100 gas dryers in five weeks — compared to 1400 in a like period the year before.

A CONTEST for appliance salesmen furnished the power behind the annual gas dryer push sponsored last year in the territory of the East Ohio Gas Co.

And the contest gimmick, used for the first time by East Ohio, is credited with giving dryer sales a healthy 50% boost over the results of the previous year's dryer promotion.

Top prizes

Stimulated by the gas company's prizes and backed by an all-media ad campaign, appliance salesmen in a five-city Ohio area moved 2100 gas dryers in five weeks. During the same period in 1953, 1400 gas dryers were sold.

The jump in sales is due in part to the fact that appliance salesmen were given strong incentive to sell gas dryers, according to Harold Eckes, East Ohio's advertising manager. Previously the company had relied mainly on a heavy ad campaign using radio, TV, newspaper, car cards, billboards and point of sale displays.

Incentives

In the latest campaign, however, the following incentives for salesmen were added:

A Grand Prize all-expense paid trip for two to the Rose Bowl Game in Pasadena, including a week of sightseeing in California.

A Second Prize of $500 in cash.

Daily prizes of $100 cash to be given away Monday through Friday each week of the five-week long sales contest.

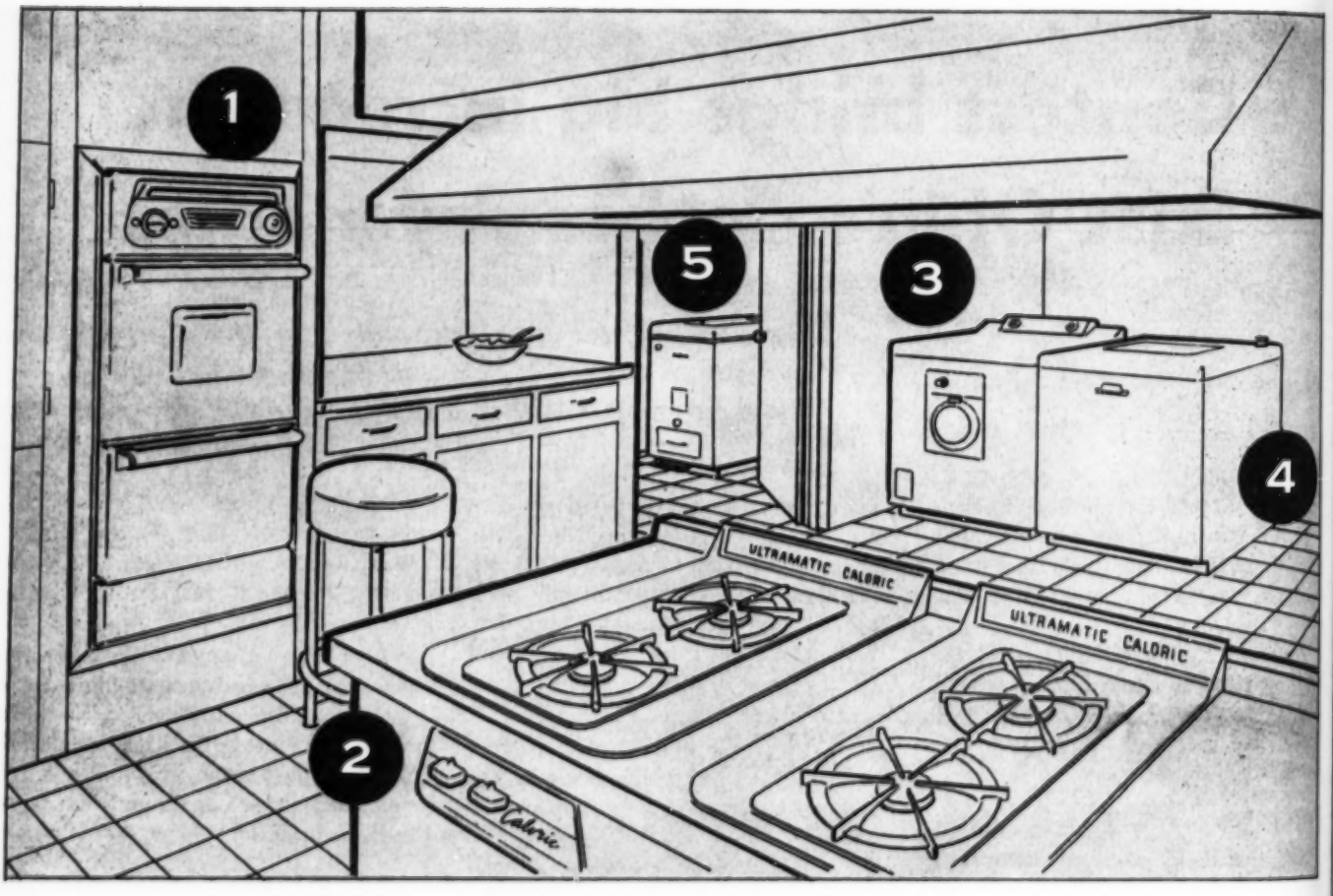
Name brand gas dryer manufacturers participated—ABC, Apex, Bendix, Blackstone, Caloric, Hamilton, Kenmore, Norge, Roper, Speed Queen, Thor and Whirlpool.

Each time a salesman sold one of the participating gas dryers, he filled out a 4 x 9-in. pink entry card, giving his name and address, the date, brand and model number of the dryer sold, and the name and address of the purchaser, installer and dealer.

Daily drawing

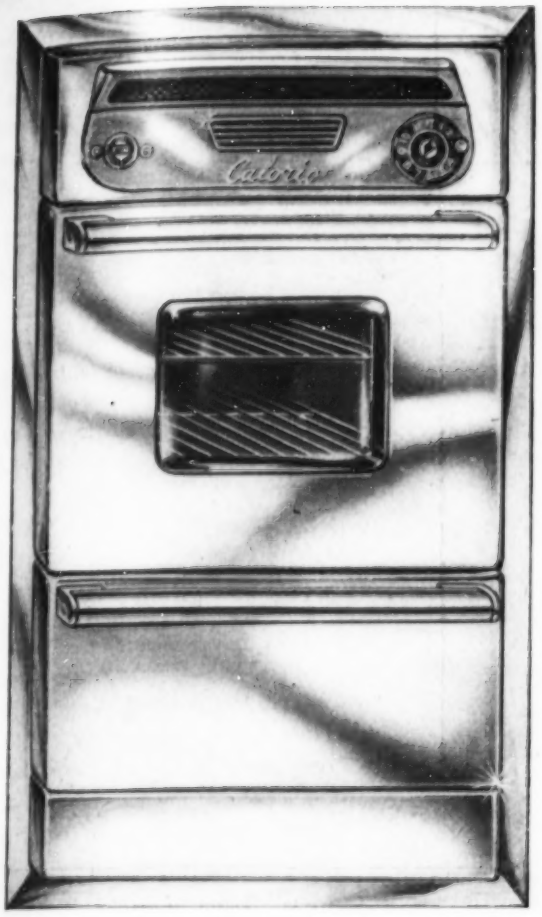
Mailed to contest headquarters at East Ohio Gas in Cleveland, the card was dropped into a giant hopper from which the daily $100 prize winners were drawn. Obviously, the more dry-

a modern Caloric kitchen-laundry will make that buyer reach for his check book



For a kitchen-laundry householders will envy and buy, pick the Caloric master line of fine appliances* . . . Caloric Built-In Cooking Units . . . Dryers . . . Washers . . . Disposers. They're designed for ultra-convenient modern living. They're styled to give the home-owner a kitchen to be proud of. They're nationally advertised. They're easy to sell.

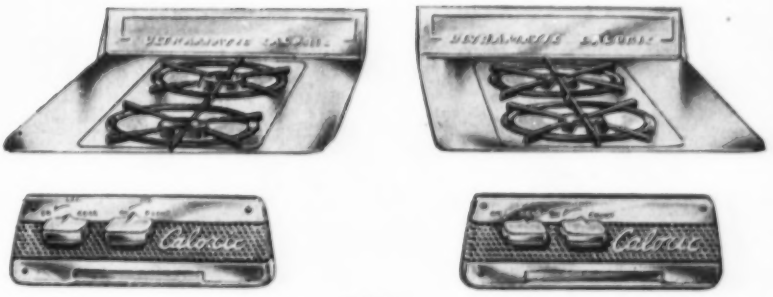
*Engineered for all natural, manufactured or LP gases.



1

CALORIC BUILT-IN OVEN-BROILER UNIT

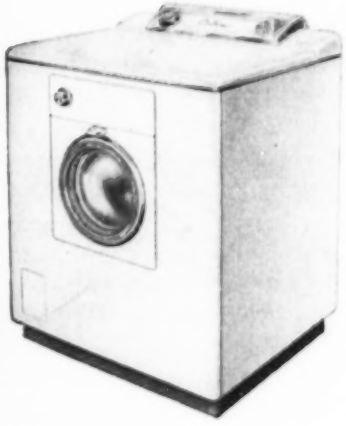
Brings added convenience to the modern gas kitchen. Smartly designed. Available in black enamel, white enamel, in pastel colors; in bright metal and satin finishes. Harmonizes with any decorating scheme. Can be installed in wood, metal, brick, or other materials. Eye-level controls eliminate stooping.



2

CALORIC BUILT-IN TOP-BURNER UNIT

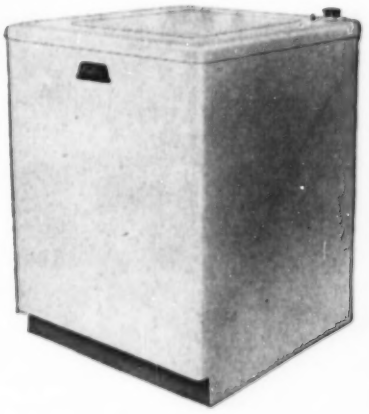
Each unit includes 2 extra-capacity Speed-Set burners. Easily installed in island, peninsula or wall counters, wherever convenience dictates.



3

CALORIC DRYER

The original LO-HEET ..HI-BREEZE automatic gas dryer. Provides safer, faster and far more economical drying. Waist-high lint trap with exclusive Sifto-Bag®. One-knob control.



4

CALORIC WASHER

Fully automatic with vibration-free Gyro-Spin balanced action. Exclusive long-stroke agitator gives 25% more washing efficiency. Simple one-knob control.

CALORIC DISPOSER

Fully automatic gas disposer gets rid of garbage, trash, everything except metal or glass. With Calor-A-Tred foot pedal it's easy to load, even with both hands full. Calor-A-Set dehydration control with three settings for normal, wet, or dry refuse.

5

CALORIC APPLIANCE CORPORATION • TOPTON, PA.

Caloric Appliance Corporation, Dept. G
Topton, Pa.

Please send me information on the Caloric master line of fine appliances and the complete Caloric kitchen.

NAME _____

ADDRESS _____

CITY _____ ZONE ____ STATE ____

Dryer campaign ... Try-it-before-you-buy-it theme used with prospects

In self-service laundries... where economy and dependability count most... 36 out of 39 use GAS LAUNDRY DRYERS!
Did you ever consider the experience of self-service laundries, when you think of a dryer for your own home?
These establishments use dryers which are identical with those sold for home use.
But, in self-service installations, dryers must pass much tougher tests for economy, speed and dependability.
A survey of the 39 self-service laundries in the Cleveland area shows that 36 of the 39 use GAS exclusively for laundry drying!
When YOU choose a laundry dryer for YOUR home... remember—
1. GAS dryers operate for much less, load for load, year after year (actual cost: about a penny a load!)
2. Gas dryers operate faster than other type of home dryers.
3. Gas dryers, with lifetime burners, give you longtime dependability.
every hour every day you're glad it's Gas
The EAST OHIO GAS Company
CHOOSE AN AUTOMATIC GAS LAUNDRY DRYER

East Ohio awakened customer interest in dryers during the contest period with newspaper ads such as this one.

ers a salesman sold, the more cards he had in the hopper and the better were his chances of cashing in on the prizes.

Still eligible

Salesmen continued to be eligible for prizes even though they were already daily winners. The only restriction was that no man could win both grand prizes, the California trip and the $500 check.

While the salesman took the field in the gas dryer push, EOG helped by advertising in newspapers, both daily and weekly, using effective car cards, truck signs and 24 sheet posters, and by advertising on post card bills to 650,000 customers.

Dealers tied in with EOG on gas dryer ads, accepting the company's special 40% co-op ad allowance on a new "Try It Before You Buy It" theme. Through this special sales gimmick, any one of the participating gas dryers could be installed in the prospective buyer's home on a free trial basis. The offer ended with the close of the contest.

Selling kit

A ready-made sales promotion kit was sent to each gas appliance salesman to help build enthusiasm for the promotion. The campaign hit these selling points:

First—gas dryers cost less to operate, just a penny a load, one-half or less the cost of other home-type dryers.

Second—gas dryers cost less to install. The total cost of the delivery, installation and guarantee is usually included in the advertised price of the appliance.

Third—gas dryers are faster, save both work and time.

Fourth—gas dryers keep white clothes white, colored things at their original brilliance. Tests made by the Ohio Experiment Station of the United States Department of Agriculture prove there is no discoloration.

Fifth—gas dryers are safe, tested and approved by the AGA Laboratories in Cleveland and the Underwriters laboratory.

Sixth—gas dryers are dependable; a gas burner is a lifetime burner.

Seventh—gas dryers have proved themselves. Forty out of 43 commercial self-service laundries in Cleveland use the home-type gas dryers.

Salesmen from 12 cities in northeastern Ohio shared in the prizes, which also included 96 merchandise awards to weekly winners. The gas range promotion was sponsored along with manufacturers of Caloric, Detroit Jewel, Grand, Magic Chef, Maytag, Perfection, RCA-Estate, Roper, Sunray, Tappan and Universal ranges.

Part 2 in a Series

The New Gas Transmission and Distribution Piping Code

ASA—B31—SECTION 8

A background discussion by **FRED A. HOUGH**

Materials and equipment: Chapter 1 of the code

THE basic requirements of the code regarding materials and equipment that become a permanent part of a gas transmission or distribution piping system is stated in paragraph B10.1, which says, "It is intended that all materials and equipment that will become a permanent part of any piping system constructed under this code shall be suitable and safe for the conditions under which they are used. All such materials and equipment shall be qualified for the conditions of their use by compliance with certain specifications, standards, and special requirements of this code, or otherwise as provided herein."

Standard specifications

Through such organizations as the American Standards Association, the American Society for Testing Materials, the American Society of Mechanical Engineers, the American Petroleum Institute, the American Welding Society, the American Waterworks Association, the Manufacturers Standardization Society of the Valve and Fitting Industry, standard specifications have been developed to which some materials and equipment entering into gas transmission and distribution systems are manufactured. These standard specifications prescribe in precise terms the chemical and physical properties and the dimensional tolerances of material or equipment manufactured under them.

In many cases they also prescribe the tests that shall be used to determine compliance with the specifications.

These standard specifications serve very useful purposes. They relieve the purchaser of the need for developing specifications of his own, a job for which he is usually not technically qualified. However, probably the most important benefit deriving from these standard specifications is the manufacturing standardization which they make possible. When standard specifications are generally used in an industry, manufacturers can design and manufacture their products to meet a few standard specifications. If no such specifications existed they would have to manufacture to many non-standard specifications, which would increase their costs and consequently their price to the purchaser.

While most specifications are developed with some specific use of the product in mind, generally speaking the limitations on the use are not stated in a specification and it is the responsibility of the purchaser or the code-writing bodies to spell out the conditions of use under which material or equipment manufactured under a given specification is suitable.

A code committee usually cannot give carte blanc approval to a specification for use under all conditions that might be encountered in an industry. Consequently the user always has the obligation of determining whether the specifications approved by a code are actually suitable under the specific conditions under which he proposes to use the item.

Standard specifications are very important to manufacturers. Consequently, they take a very active part in their development and usually their interest is greater and more sustained than the interest of the user groups. Therefore, standard specification committees tend to be dominated by the manufacturers and the tendency is for the tolerances prescribed in a specification to be broad enough so as to reduce to a minimum the rejects which a manufacturer will have. This very often results in the tolerances in a specification being so broad that the user cannot be sure that material or equipment purchased under the specification is going to be suitable for his specific use.

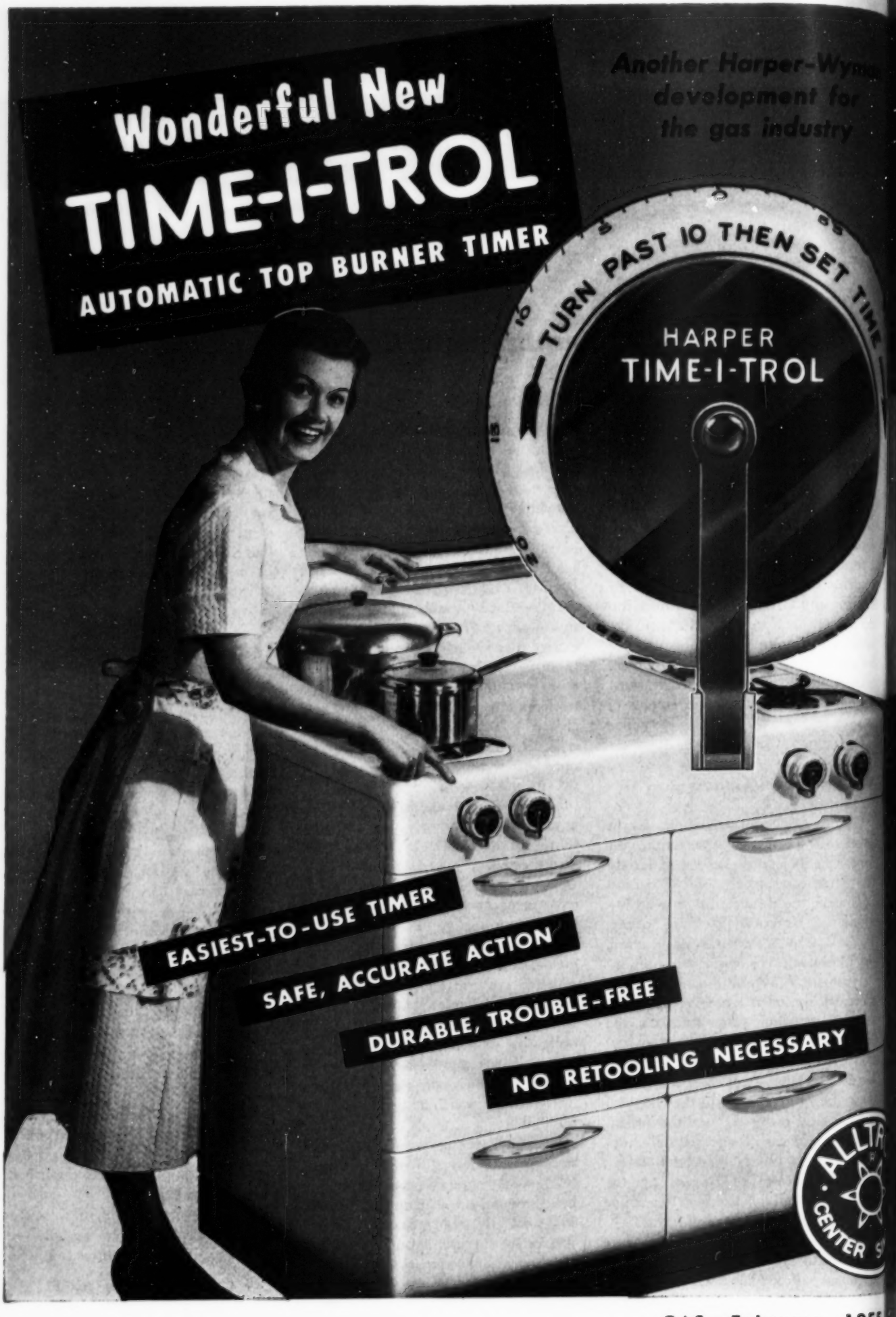
Line pipe specification

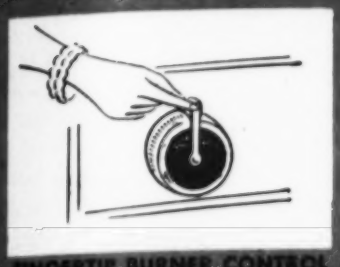
Consider the API 5LX specification for line pipe, for example. This specification was developed to meet the natural gas transmission industries' need for pipe with high yield strength. Until it was recently revised, there were no chemistry limits specified for grades higher than X-42. As a result, a purchaser of pipe manufactured under 5LX-52 might obtain pipe that is readily weldable under the field conditions under which the pipe must be welded, or he might obtain pipe that was not weldable except by special procedures. Consequently, the user had to be alert to this situation and be prepared to use special welding procedures if difficulties were encountered.

Through the efforts of Subcommittee 8 and the cooperation of the API pipe specification committee and the pipe manufacturers, this defect has been partially eliminated through the inclusion of limitations on chemistry in the latest edition of API 5LX published in November, 1954.

The important point here is that a manufacturing problem was allowed to influence the specifications to the point

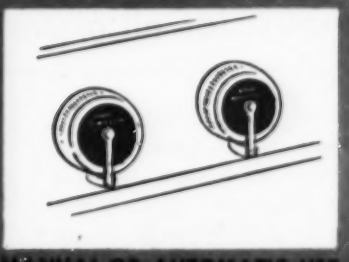
Continued on page 72


Another Harper-Wyma development for the gas industry
Wonderful New
TIME-I-TROL
AUTOMATIC TOP BURNER TIMER
TURN PAST 10 THEN SET TIME
HARPER
TIME-I-TROL
EASIEST-TO-USE TIMER
SAFE, ACCURATE ACTION
DURABLE, TROUBLE-FREE
NO RETOOLING NECESSARY



FINGERTIP BURNER CONTROL

NO STOOPING TO SET



MANUAL OR AUTOMATIC USE

"TIME IT WITH TIME-I-TROL"

Only top burner timer that automatically turns valve to "OFF" position!

The new Harper TIME-I-TROL fastens directly to the top burner valve to make one sturdy unit . . . can be used on all the top burner valves. It provides features that mean easier, thriftier, better-than-ever cooking.

Set it for any length of time up to 60 minutes; when the time's up, "click"... the valve closes and the handle returns to safe "off" position. Valve can be operated manually without using the Timer if desired. TIME-I-TROL is a convenience feature that's easy to demonstrate..."clicks" with customers ...can help increase *your* gas range sales!

Range Manufacturers: Learn how you can add this new sales appeal to your ranges—at lower cost than you may think. TIME-I-TROL requires *no* special tooling, *no* extra valves, *no* increased labor costs! Write or phone today for the exciting facts about Harper TIME-I-TROL!

HARPER-WYMAN COMPANY

Dept. H25-G • 8562 Vincennes Avenue • Chicago 20, Illinois

ORIGINATORS OF CENTER SIMMER BURNERS

Piping code ... Standard specifications do not exist for all materials and equipment

that they no longer protected the user in one very important respect; and too, a standard specification sometimes does not specify some property which is very important to the user. For example, the standard line pipe specifications do not include any impact test requirements. This is an important property of the pipe when used at low temperatures and it is therefore necessary for the user to recognize that when conditions exist that demand good low temperature impact properties, he cannot look to the standard specifications for protection.

A specific reference to a problem of this type is contained in Section 814, which says, "Some of the materials conforming to specifications approved for use under this code may not have properties suitable for the lower portion of the temperature band covered by this code. Engineers are cautioned to give attention to the low temperature properties of the materials used for facilities to be exposed to unusually low ground temperatures or low atmospheric temperatures."

Section 811.21 of the code says, "Items which conform to standards or specifications listed in this code may be used for *appropriate applications* as prescribed and limited by this code without further qualifications." (Italics mine.)

The point which I have been trying to emphasize thus far in this discussion is that while standard specifications are very useful and helpful, it behooves a code committee and a user to examine such specifications critically to see if they really give adequate protection and cover all of the properties which are important in the use under consideration.

Some people believe that only materials and equipment conforming to standard specifications should be permitted by the code in gas transmission and distribution systems. While this might be a desirable policy at some distant future time when both code writing and specification writing have developed to a greater extent than they have now in the gas industry, Subcommittee 8 did not adopt this policy at this time for numerous reasons. Among these are: (1) Standard specifications do not exist for all materials and equipment used in gas transmission and distribution piping systems. (2) As we have pointed out above, standard specifications by themselves do not assure safety. In many cases a modified specification designed to meet some special condition of use will be better from a safety standpoint than standard specification. (3) The use of new materials or equipment would be delayed for months or even years if the code required that they must be built to a standard specification. It sometimes takes that long to develop such a specification. Furthermore, without experience in actual use it is difficult or impossible to develop a really satisfactory standard specification. (4) If every item entering into a gas transmission or distribution system, no matter how small or unimportant from a safety standpoint, had to conform to a standard specification, a great deal of unnecessary and cumbersome red tape would be created. (5) Gas utilities and pipeline companies often find it necessary to retire from service material or equipment that is in satisfactory condition for reuse. In many cases the original specifications under which the material or equipment was manufactured are not known or are now obsolete. There are, however, uses to which such material can be put which are entirely safe and represent good engineering. Consequently the code prescribes a procedure whereby such material can be qualified for use.

The code imposes a specific obligation on the user to determine the suitability of materials and equipment that he uses. Paragraph 811.24 says in part, "Materials and equipment not covered by standards or specifications listed in this code may be qualified by the user by investigation and tests (if needed) that demonstrate that the item of material or equipment is suitable and safe for the proposed service, and provided further that the item is recommended for that service from the standpoint of safety by the manufacturer."

There are two questions involving pipe specifications which arise so frequently in connection with the design of high pressure, large diameter, gas transmission lines that they are worthy of some detailed discussion here. These two questions involve the specified minimum yield strength of the pipe and the under-thickness tolerance of the pipe. All line pipe specifications prescribe a specified minimum yield strength. The code states that the maximum operating stress in a pipeline shall not exceed a stated percentage of the specified minimum yield strength prescribed in the specifications under which the pipe is purchased from the manufacturer. In almost all cases, tests run on coupons cut from pipe at the mill disclose a higher yield strength than the specified minimum.

This raises the question as to whether the minimum yield strength observed in these tests may be used as a basis of design rather than the specified minimum yield strength. The answer is no for two reasons.

Only a sample

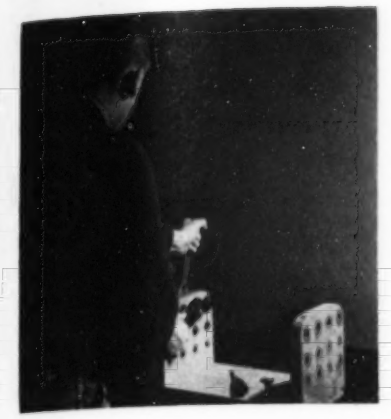
First, the tests represent only a sample of the pipe going into the pipeline. There is a possibility that the weakest pipe was not sampled. Second, it was recognized by the code committee that pipe manufacturers will nearly always produce pipe which has higher values than the minimum guaranteed, so as to reduce their risk of having pipe rejected for failure to comply with the specifications.

Consequently nearly all pipe now in use upon which the industry's experience is based has higher physical properties than the specified minimums under which the pipe was purchased. These facts were taken into account by the committee when establishing permissible stress levels and other conditions of use.

Likewise, pipe wall thickness measurements that indicate that all of the pipe measured has greater thickness than the minimum required by the specifications do not warrant taking advantage of this fact in the design of the pipeline. Here again there is a chance that the thinnest portions of the pipe were not measured, and furthermore, as before, the industry's experience is based on pipe which generally is thicker than the specified minimum thickness contained in the specification under which the pipe was purchased. Again, these facts were taken into consideration by the code committee in setting up stress levels and other conditions of use.

The upgrading of pipe on the basis of random sampling is always prohibited by the code.

GAS exclusive



Is personality testing a valid tool for employee selection and promotion, or it is a pseudo-scientific booby-trap? The author believes it is a substantial aid in this work, if tests and methods are carefully chosen and properly used as an adjunct of standard hiring procedures.

How Milwaukee Gas "job tests" its employees

By **JOHN C. BEAMISH** • Milwaukee (Wis.) Gas Light Co.

THE need for supervisory personnel, virtually universal in American industry, was the factor chiefly responsible for the development of a personnel testing and clinical evaluation program at the Milwaukee Gas Light Co. The retrenchment of the thirties followed by the military manpower demands of World War II created a serious gap in the development of management personnel.

At this company the shift from manufactured gas to natural gas in 1949 added greatly to this problem. Within a very short time the facilities for manufacturing gas were reduced to standby status, and the company was confronted with attendant problems and adjustments involved in the installation of a natural gas system. Other organizational changes, such as the transfer of much of the general accounting and payroll work to machine accounting, further complicated the situation.

Supervisory posts

These organizational changes necessitated the creation of many new supervisory positions, the elimination of others, and radical changes in the duties of many of the remaining positions. In terms of management people, this meant fitting experienced supervisors into work very different from any they had done previously and finding candidates for positions that could not be filled by transferring present supervisors.

Management, confronted with problems of transfer and selection unique in the history of the company in their scope and magnitude, turned to psychological testing for help. Testing has proved so valuable that it is now accepted policy that all candidates for supervisory positions be tested. Management is also building up information concerning present supervisors by testing the entire supervisory force, one department at a time. Supervisors very close to retirement are not included in this program.

New development

The success of the supervisory testing program led to the development of a program for candidates for non-supervisory jobs. All applicants for initial employment and all candidates for promotion or transfer are tested. This applies to office and physical jobs, to male and female candidates.

The reasons behind the adoption of this program differed from the considerations leading to supervisory testing. Union labor agreements exist with both office and physical workers. Under these agreements, seniority is a very important factor in promotion to virtually all non-supervisory jobs. These seniority provisions, plus the extremely low turnover rate at this company, make it very probable that a new employee, regardless of the level at which he is hired, will advance to jobs of increasing responsibility and importance.

Raising the caliber

Unless initial selection is restricted to those capable of handling the higher level jobs, the company must accept eventual marginal or unsatisfactory performance in these more important jobs. Testing has proved very valuable in raising the caliber of initial selections. The testing of present employees who are candidates for promotion reflects the gradual acceptance of both office and physical unions of testing as a supplement to seniority in selection for these jobs.

Personnel testing at Milwaukee Gas Light involves three areas: (1) General level of mental ability, (2) special skills and knowledge required for the position in question, and (3) personality and interest. Tests used to measure the general level of mental ability include the Wonderlic personnel test, Purdue adap-

tability test, California test of mental maturity, and Wechsler-Bellvue intelligence scale.

The Wonderlic is a 12-minute test consisting of 50 questions. It is effective in measuring persons of average or superior mental ability and is administered to candidates for supervisory positions and to applicants for office jobs.

The Purdue adaptability, a 15-minute test of 35 questions, is best suited to applicants for jobs that do not place great emphasis on high mental ability. This is given to applicants for physical jobs.

The California test of mental maturity contains 145 questions. It is divided into seven sub-tests each of which must be timed separately. The sub-tests range from four to ten minutes. The entire test requires slightly more than an hour to administer, including time for directions. This test provides a profile of four areas of mental ability: spatial relations, logical reasoning, numerical reasoning, and verbal concepts (vocabulary). Candidates for sales positions where the comprehensive profile of abilities is most valuable are given this test. Only the time-consuming administration prevents this test from use with other groups.

Individual test

The Wechsler-Bellvue can be given to only one person at a time. (All tests previously discussed can be administered to groups.) This test contains 11 sub-tests: vocabulary, information, digit span (memory), comprehension, arithmetic, similarities, block design, digit symbol, picture completion, object assembly, and picture arrangement. The entire test is not given to any one candidate. Selected sub-tests are given to candidates for office positions to supplement the Wonderlic and to measure abilities in the areas most important for the job in question. Three or four sub-tests, requiring approximately 30 minutes, are normally used. Selection of the sub-tests varies with the job. For example, switchboard operators would receive vocabulary, digit span, and comprehension; telephone order clerks or customer interviewers (both of whom handle complaints and requests for service from customers) would receive vocabulary, comprehension, and arithmetic; draftsmen would receive block design (spatial relations), arithmetic, and comprehension. The Wechsler is valuable for the opportunity it gives the examiner to observe the examinee's approach to the problems, as well as for the actual scores obtained.

Tests of special abilities include the Bennett test of mechanical comprehension (forms AA, BB, and CC), the Minnesota clerical test, the Martin aptitude stenographic and typing tests, the industrial training classification test, the computational aptitude test (from Roeder and Graham, *Aptitude Tests for Occupations*), the Revere safety test, and the Bennett hand tool dexterity test. The Bennett mechanical comprehension is given to all operating personnel. Form CC is used with graduate engineers, Form BB with non-engineer supervisors and supervisory candidates. Form AA is used with applicants for physical jobs. These tests are untimed with 30 to 45 minutes about average for most examinees. Great variation has been found in the time required by different examinees.

The Minnesota clerical test involves speed and accuracy in checking names and numbers. Eight minutes are allowed for numbers, seven for names. Candidates for supervisory or office positions involving responsibility for the accuracy of reports or records are given this test.

The Martin stenographic and typing tests are given to office applicants for jobs involving those skills.

The industrial training classification test allows 35 minutes for simple computations and the interpretation of scale drawings. This test is given to draftsmen.

The computational aptitude test requires the examinee to judge the most accurate of several given answers to arithmetic problems. Fifteen minutes are allowed. This is given to applicants for office jobs of a statistical or computational nature.

The Revere safety test is a 20-minute test of knowledge of safe practices. It is given to applicants for physical jobs and to candidates for supervisory positions in operations.

The hand tool dexterity test involves speed in removing and replacing nuts and bolts using wrenches. It is given to all applicants for physical jobs.

In the areas of interest and personality three tests are used: the Kuder preference record, the Thurstone temperament schedule, and the Thematic apperception test. The Kuder gives interest scores in 10 areas: outdoor, mechanical, computational, scientific, persuasive, artistic, literary, musical, social service, and clerical. It is untimed. Forty-five

Mr. Beamish is supervisor of psychological evaluation and research at Milwaukee Gas Light.

minutes is about the average time required for this test. All persons tested are given the Kuder.

The Thurstone temperament schedule indicates scores in seven categories: active, vigorous, impulsive, dominant, stable, sociable, and reflective. It is not timed. Twenty minutes is about the time usually required.

The Thematic apperception test (usually called the TAT) is an individual type test. It consists of a series of pictures which are shown to the candidate, one at a time. In each case the examinee is asked to tell a story about the picture, indicating what has come before, what is happening in the picture, and what the outcome will be. The pictures are so generalized (or "unstructured") that a wide variety of stories result. In formulating his stories the examinees will "project" his own personality and, thus, the examiner will secure valuable clues to the personality structure of the examinee. Selected pictures from this test are shown to candidates for office jobs. The entire test is not given to any one candidate.

Thus far the "why" and the "what" of personnel testing at the Milwaukee Gas Light Co. have been discussed. The procedure by which testing is fitted into general personnel operations—the "how" of the program—and the methods used to evaluate the results of testing remain to be treated.

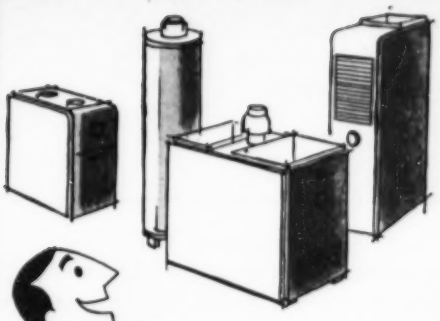
The testing procedure is set in motion when personnel are referred to the department of psychological evaluation and research. In the case of applicants for initial employment such referrals are made by the employment department. Applicants are interviewed and references are checked by employment and only those who appear to be reasonable candidates for employment are tested. Candidates for non-supervisory jobs consist of present employees who have applied for the job in response to a "posting"—a notice stating that

Continued on page 78

1

a name your customers know and want

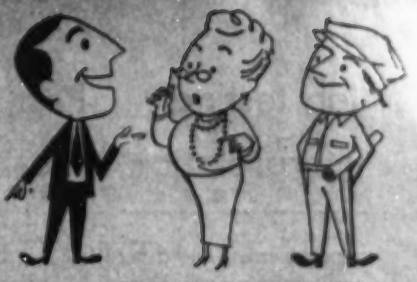
For 46 years THE name in automatic home comfort. Over 5,000,000 units in use. A great asset for the dealer who displays the Bryant Home Comfort sign!



2

the most complete line

Gas and oil furnaces, boilers, central and room air conditioners, space heaters, unit heaters, water heaters—for every purpose, every purse—from one source!



quality equipment for every market

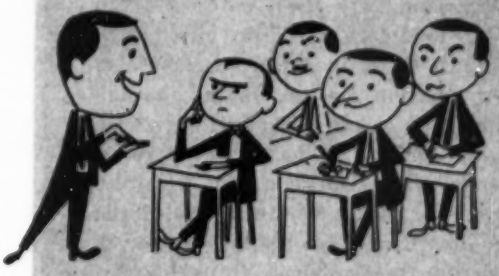
De luxe units for discriminating customers . . . standard units for the mass "new-home" market. Famous Bryant quality—Bryant engineering excellence—in both lines . . . down the line! Ask your Bryant Distributor for the facts.

3

exceptional distributor service

Bryant Distributor is near at hand ready with complete engineering, sales and service assistance to help you sell and install the complete Bryant line—*profitably*. He's there to serve you; it pays to know him well!

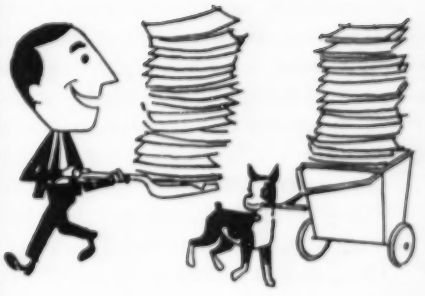
4



professional sales training

Organized factory classes—comprehensive field schools—conducted by a full-time professional staff. For all qualified Bryant dealer personnel.

5



personalized selling tools

The most complete and completely practical selling literature lineup in the industry — including Bryant promotional letters, folders, displays, etc. . . . designed and printed *especially for your own use.*

6

full-color national ads featuring YOU

telling your customers that you are "Mr. B"—the man to see for top quality home heating, air conditioning and water heating...Bryant, of course!

7

co-op "Mr. B" ads in your local newspaper

Focusing the full power of Bryant's sales-getting program on your customers, over your name, in your own community. Be a power . . . be "Mr. B"!

8

Be "Mr. B"— Mr. BIG in the big home heating, air conditioning and water heating business. Only Bryant enables you to be "Mr. B" . . . to build your business *all* 8 of these practical, profitable ways. For bigger profits now, for a secure and prosperous future — *see your Bryant Distributor!* Ask him about Bryant's big "Mr. B" action program, and how it can make sales and money for you.

Job testing . . . Past records influence interpretation of test results

vacancy exists and describing the duties and qualifications of the job. Normally all candidates are tested. However, if a large number of persons apply, only those whose seniority entitles them to top considerations are tested. If none of these qualify, further testing is scheduled. Candidates for supervisory positions are recommended by executives in the department concerned. When the supervisors of an entire department are being tested, all supervisors except those near retirement age are scheduled.

Study of records

When a list of candidates is received, all available records are secured and scrutinized. With applicants for initial employment, these records normally consist of the application blank (including comments by the employment interviewer), references from previous employers and educational records. With present employees personnel folders are studied. These records may provide clues that influence the selection of the test batteries. A candidate who has had training or experience in an area different from the one under consideration may be tested in the other area, as well as the one under consideration. This provides data of future value or possible alternative placement if the candidate is not selected for the job he is seeking.

Whether or not the records influence the selection of tests, they always influence the interpretation of test results. For example, identical mental ability test scores would have very different meanings for a 30-year-old college graduate accountant and a 40-year-old operating foreman who had only an eighth grade education. A mechanical comprehension score that might enhance the employment prospect of a boy just out of school with no experience in such work, might be considered weak for a man with 15 years of experience as a mechanic. Similar examples could be given for other special ability tests.

It is in the field of interest and personality, however, that interpretation in the light of all available data is most important. Both the Kuder and the Thurstone may be "slanted" by the examinee to bring out scores favorable for selection for the job in question. (The Kuder has a "verification" score, but this rarely falls outside the approved range). This slanting may be deliberate by the examinee, or it may result quite unintentionally as a result of the job in question being sharply focused in his mind. In either case the test results cannot be accepted at face value.

The TAT is very valuable in disclosing such slanting because, by its very nature, it does not lend itself to slanting. A sales applicant, for example, who would automatically show a high "persuasive" interest on the Kuder and high "dominance" and "sociable" scores on the Thurstone, is at a loss to know how he should react to a picture of a boy looking at a violin in order to further his chances for selection. Reference to other test results may also disclose discrepancies. For example, one examinee showed the highest possible score in "literary" interest on the Kuder. On the vocabulary section of the California mental maturity, however, his score was less than half what would have been expected by pure chance—if he had known none of the words.

While such comparisons of test against test are very useful, the greatest reliance is placed in test-record comparison. The person whose tests show him to be very gregarious is expected to be active in church, club, or social groups. If he is not, the reasons are sought. Sometimes the reasons are perfectly plausible—one examinee had been forced to change the pattern of his activities by the prolonged, serious illness of his wife. Unless good reasons are discovered, the test scores are discounted.

Clinical evaluation

After the actual testing, the procedure differs according to the job. Supervisors, candidates for supervisory positions and sales applicants are referred to a consulting psychologist for clinical evaluation. In the cases of all other examinees a report summarizing the test results is prepared by the supervisor, psychological evaluation and research. In all cases the examinee has an opportunity to discuss his test results. All reports from the psychologist are studied for information and recommendations that might be of value to the candidate. When it is deemed beneficial, the candidate is invited to a post-evaluation interview where the psychologist's recommendations are discussed.

In the actual selection the test results and psychological evaluations are added to all other information concerning the candidates. Only where the tests disclose a level of ability clearly below minimum requirements for the job is rejection based solely on testing.

To evaluate the results of testing, comparison is made between test results and production records, safety, grievances, performance review (merit rating), and any other relevant data that may be available.

Large scale personnel testing at Milwaukee Gas Light is of recent origin.

Continued on page 82

SUMMARY OF TEST BATTERIES

Group	Mental	Special*	Personality and Interest	Evaluation
Supervisors	Wonderlic	Bennett BB Revere safety Minn. clerical	Kuder Thurstone	by consulting psychologist
Engineers	Wonderlic	Bennett CC Revere safety	Kuder Thurstone	by consulting psychologist
Salesmen	California mental maturity		Kuder Thurstone	by consulting psychologist
Office	Wonderlic Wechsler-Bellvue	Minn. clerical Comp. aptitude Stenographic and typing Industrial training class.	Kuder Thurstone TAT	by examiner
Physical	Purdue adaptability	Bennett AA Revere safety Hand tool dexterity	Kuder	by examiner

*Used only when applicable to specific job.

Automatic GAS water heaters

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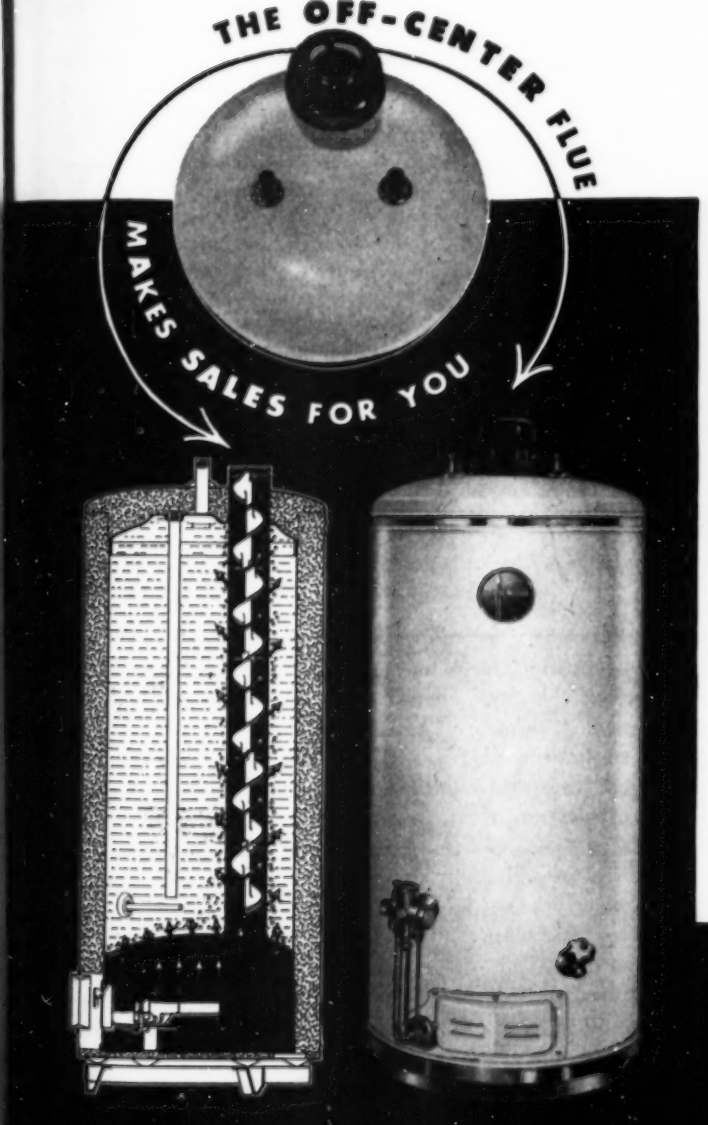

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QUALITY PRODUCTS JOHN WOOD SINCE 1867

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Mr. Beamish rebuts the "Fortune" article

The article "The Fallacies of Personality Testing" in the September 1954 issue of *Fortune* presents a number of criticisms which can be answered in terms of the Milwaukee Gas Light Co. testing program.

Several related arguments in *Fortune* mention the use of a specific range of "acceptable" personality test scores under which many executives would be rejected by the testing programs of their companies if they answered the questions truthfully. It is stated further that the norms on which the tests are scored favor the conventional person and penalize the original or unusual examinee, despite the fact that the unusual person may be much better qualified for executive success. It is also pointed out that validation of the tests often consists solely of demonstrating that tests agree with each other; that very definite interpretations are sometimes based on ridiculously shallow evidence; and that since the approved answer is often very easy to determine, the norms which are used to score the tests are probably based on "slanted" answers.

These criticisms are relevant only when: (1) tests are interpreted without reference to other available information, and (2) a predetermined pattern of personality traits is the basis of selection or rejection. Neither condition is true at Milwaukee Gas Light, where tests are interpreted only in the light of all available data, and personality tests are used solely to obtain clues that the examiner can pursue in developing a comprehensive picture of the individual's personality. In other words, the personality tests are never used to obtain scores which are, per se, satisfactory or unsatisfactory, but rather to aid in obtaining a picture of the individual which can be used in judging his fitness for the position in question.

As a case in point a candidate for foreman in the distribution department showed an ideal interest and temperament pattern on the tests given him. He had very high outdoor, mechanical, computational, and persuasive interests. His temperament profile showed him to be high in vigor, dominance, stability, and sociability. Had all this been true this man would have been well suited to the leadership of a crew doing outdoor mechanical work. His general mental ability score was also favorable. High mechanical interest plus good general mental ability should equal high mechanical comprehension. This candidate, however, had very low mechanical comprehension.

In the interview that followed he admitted that he did not repair his own car, did not have a home workshop, had no hobbies of a mechanical nature. Although his work history showed that he had been employed in mechanical type work for more than 10 years, he had made no effort, either in formal classes or by self-directed study, to acquire an adequate knowledge of mechanical principles. To probe his alleged outdoor interest and high vigorous score, he was questioned about vocational and recreational activities of an outdoor nature. He was unable to mention very few such activities. His high persuasive, dominance, and sociability scores led to investigation of his participation in group activities. A person with his scores would be expected to be a member of various church, social, and/or political groups and to have had a number of leadership experiences (offices, committee chairmanships, etc.) This man, however, had rarely been a member of such groups and had never demonstrated any capacity for leadership activity. Needless to say, he was not selected.

Thus, by using his interest and temperament scores only as clues to be investigated, we were able to build a picture of this man which showed clearly the proper disposition of his candidacy. Had we accepted the personality tests at face value, however, we would have deserved the criticism of the *Fortune* article. *Tests are not a substitute for judgment but a means of providing data on which the examiner's judgment can be based.*

The charge is made that some of the tests constitute an unwarranted invasion of privacy. This is a very real danger, which we kept clearly in mind. Several tests, including some mentioned by *Fortune*, were rejected at this company to avoid this invasion of privacy. No evidence has come to light that would indicate that the tests used here are resented on this basis.

It is charged that some companies restrict their selection to persons with a particular personality pattern and then point to the fact that their top executives possess these personality patterns as proof of the value of the testing. Admittedly, if only one type of person is selected, successes (and failures as well, for that matter) must be made by this type of person. It is our belief, however, that if tests enable us to find the type of person we want, they are doing all they can for us. We must decide whether or not a candidate is suited for the job after the tests provide the data to show us what type of person he is.

Fortune points with glee to a reported incident in which the executives of a particular company rejected personality testing altogether. The importance of acceptance, not only by executives but by persons at all levels in the company, was recognized at the Milwaukee Gas Light Company from the earliest conception of the testing program. Every step connected with the program has been studied in the light of its impact on company personnel. The belief that no program, however impressive from a technical point of view, can succeed without the wholehearted acceptance of the people involved has been the guiding principle in the development of testing at this company. The rights of the individual to scrupulously fair treatment and to freedom from excessive prying deserve, and get, constant attention. Far from rejecting testing, executives, and other personnel, at the Milwaukee Gas Light Company have expressed increasingly favorable interest in the program.

The program was developed to aid in selection in terms of three criteria: (1) ability to perform adequately in the job or position initially under consideration; (2) ability to move successfully into higher level work; and (3) possession of the traits and qualities desired in an employee or supervisor.

Of these goals only the first can be judged with any degree of confidence so soon after the inauguration of the program. The results appear to be very encouraging. Sales records of salesmen selected with the aid of testing are superior to those employed prior to the use of tests. An accounting supervisor, selected with the aid of tests, has earned a top performance rating from his superior in less than a year. Selection of supervisors in the distribution department and service shops has revealed very good correlation between test results and job performance. One man, whose eighth-grade education might have caused him to be rejected, demonstrated exceptional native ability on the tests. Now completing his first year as foreman, he has received consistently favorable ratings from his superiors.

Wherever testing has been used, the results to date indicate that it is providing valuable, reliable data. Perhaps the best evidence of the success of the program thus far is the growing acceptance of it by persons at all levels throughout the company. Executives are displaying increasing interest in test results. Employees are requesting the opportunity to be tested. Both the office and physical

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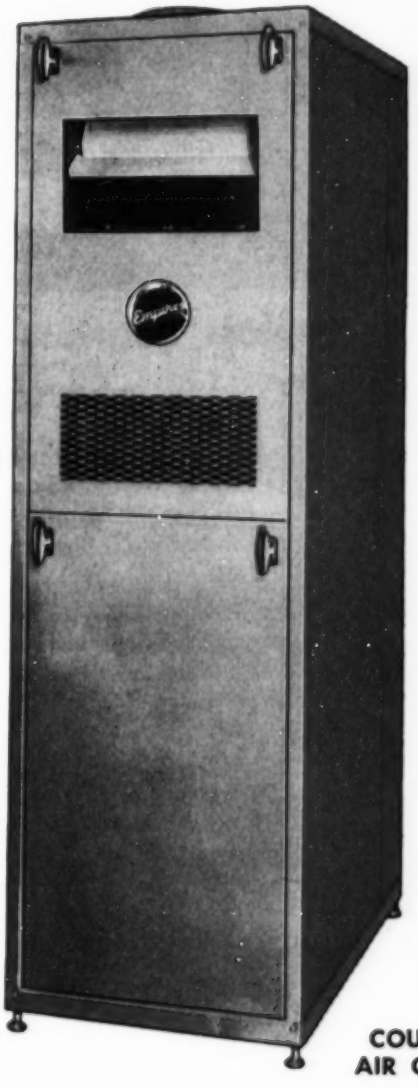
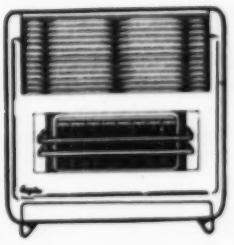
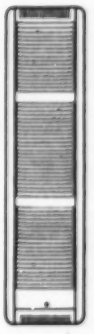
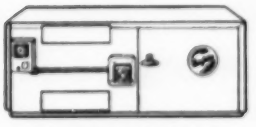




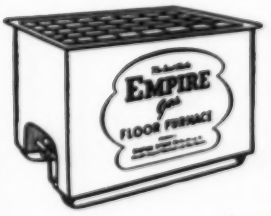
Gas CIRCULATOR HEATER

ZONE CONTROL RECESSED HEATER





HORIZONTAL *Gas* HEATER



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"Baby Digger" truck loads in close quarters, has big capacity, digs up to 20" wide, 5' deep

This East Ohio Gas Company job, the replacement of a main extension, shows why the Cleveland Model 92 "Baby Digger" is so widely used for city digging. The "92" puts the edge of a trench within 17 inches of a parallel wall, loads excess spoil directly into trucks at the curb, and affords the operator full visibility of the whole job.

Its exclusive Cleveland multispeed transmission provides over 30 evenly graduated digging wheel and crawler speed combinations, from 6 inches to 30 feet per minute. Its lower wheel speeds enable it to pick its way safely through the numerous underground obstructions typical of city digging. The three lower of its four wheel speeds provide the correct power applications for digging in even the toughest soils. And its highest speed combinations, of course, assure high daily footage on jobs where high production rates can be used to advantage. It has ample capacity for trench from 10 to 20 inches wide, down to 5 feet deep.

Compactness, maneuverability, speed combinations, capacity—if most of your trenching jobs are city jobs, the "92" is *the trencher for you!*

And does it get around! The "92" hustles safely from job to job . . . at legal limit speeds . . . because it's so easily portable on the drop-axle, tilt-bed Cleveland T5 Trailer.

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Job testing — continued

unions have demonstrated steadily increasing confidence in testing.

The program that has been described was tailored to the needs of our company. For example, the extensive testing of low level office and physical workers is justified only by the extremely low turnover rate (less than 1%) and the policy of promotion from within. If the only objective were the selection of file clerks and messengers, testing would be drastically reduced. The selection of the specific ability tests now in use was due to the importance of the abilities measured in jobs at this company.

Testing in the area of personality presents a number of problems. An article in the September 1954 issue of *Fortune*, called "The Fallacies of Personality Testing," points out several of the dangers which had to be avoided in setting up the Milwaukee Gas Light program (see page 82).

Among these are the use of tests in selecting persons to be laid off, prying into areas of an examinee's life that are strictly his own business, establishing specific personality patterns that the examinee was required to score to avoid rejection, making interpretations that go beyond the evidence, and failing to gain acceptance of the testing program by company executives. Each of these points has received constant, careful attention at this company. The policy to be used in the unlikely event of a reduction of the work force is clearly defined in both office and physical union contracts. Tests have been selected with full consideration to possible invasion of privacy.

Several tests, including some mentioned in the *Fortune* article, were rejected largely for this reason. Great care is taken to interpret the tests only in the light of all other available data. In this procedure no candidate could be rejected because of failure to fit a preconceived personality pattern. There is constant effort at this company to maintain and increase the confidence of executives (and other personnel as well) in the testing program.

All available evidence indicates that testing can provide reliable, valuable data—data that could not be secured in any other way. When these data are used to supplement and clarify all other available information, personnel selection is measurably improved. ■

Hardwick... the range for smart homemakers

Now! Hardwick is high-styled for today's selling.....today's living!

Your Hardwick line, always your *volume* line, always the gas ranges that give the World's top cooking performance, now bid to make your selling job even easier. For from the drawing boards of America's top designers has come a series of new high-fashion designs to make your Hardwick line for 1955 the smartest, most glamorous gas ranges ever produced. Your 1955 Hardwick Gas Ranges will add distinction to your selling floor, and to the kitchens of your customers. Order in depth for your biggest selling season in history.

Hardwick stove company · cleveland, tennessee

GAS new products

To secure further information on products or new literature, simply fill out the coupon and mail, indicating by number the information or literature needed.

1 Gas Ranges

Caloric's line of 1955 ranges has been restyled from top to bottom. Caloric's Roto-Ray Barbequer is available in both 36- and 40-in. clock-controlled Hi-Broiler ranges (both pictured). Motor driven, the Barbequer spit rotates meat, poultry or game under the radiant burner in the burner. The spit rests in an easily removable bracket and a detachable handle allows easy carrying to table or terrace.

There are ovens in three different widths: a 13-in. pastry oven, a full size 16-in. oven, or the large "Harvest" oven, which is 20 in. wide. The homemaker can choose a two-oven range, or a high level boiler with rotisserie, and she may have automatic oven and broiler lighting, four burners or six, in a divided or cluster arrangement.

Needle pilots, a Caloric adaptation of the "hypodermic" needle pilots, are used with all surface burners.

Caloric Appliance Corp.

2 Solenoid Valve

Crise Controls division, Acro Manufacturing Co., is producing a new solenoid gas valve designed for use on all types of gas burning appliances and with all types of gases. Corrosion resistant construction make the Crise valve especially suited for use with sour gas. Other features include soft-seat construction, quiet operation, and positive shutoff.

The valve is available in ½-in. and ¾-in. sizes, 24V and 115V.

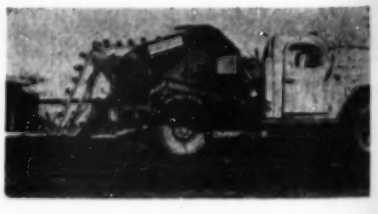
Crise Controls Div.

3 Dew Point Hygrometer

A new dew point hygrometer (No. 900-1) for measurement of dew point temperature over the range from + 18° C to — 50° C has been announced by Burton Manufacturing Co. The new instrument permits measurement of dew temperatures within ± 1° C in the range noted, with continuous sample flow at rates between 500 and 200 cc/min. and pressures between ½ and 1½ atmospheres.

An electronic system comprising photocells and an oscillator continuously "observes" a minute mirror on which the dew is formed and holds the mirror at the dew point temperature. The temperature is read out on a fine wire thermocouple which is integrated with the mirror and permits either visual or recorded results.

Burton Manufacturing Co.



4 Truck-mounted Ditcher

Barber-Greene's new four-wheel drive truck-mounted ditcher (Model 711) offers a 45-mph road speed plus such features as a fully enclosed operator's cab, lights, regular truck steering, etc. Model 711 may be equipped with either of two digging booms, one with a 5-ft digging depth, the other with a 3-ft, 6-in. depth. Either boom is adapta-

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The Regulator itself — the Thermac "T" Series, is very simply and ruggedly designed with so few parts it is practically fool-proof. High in capacity — easy to install in cramped and crowded quarters. Easy to service without removal from line. All these features plus universal acceptance by *leading* appliance builders means that your selection of Thermac will be highly regarded wherever your appliances are sold.

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new products • *Cont'd.*

ble to digging 8½-, 12-, 15-, or 18-in. in width.

The company's hydraulic drive mechanism, "Hydra-crowd" is also employed on the new ditcher. The operator may handle all of the controls, while seated in the cab or can operate them from a standing position on the ground alongside the machine.

Barber-Greene Co.

■

5 Range Ignition System

Roper's "Insta-Lite" ignition system, which automatically lights top burners, oven, and broiler, has been incorporated in several of the company's 1955 ranges: the 40-, 36-, and 30-in.; the Rangette, the extra-capacity Town and Country, as well as the gas kitchen-heater ranges.

Roper's Insta-Lite ignition consists of a shielded "hypodermic" needle with a tiny, constant-burning bead of flame. In addition to instant, positive lighting, the system affords an absolutely cool cooking top and substantial fuel savings.

Geo. D. Roper Corp.

■

6 File Accessories

Four new accessories for use with motorized Diebold super elevator files expedite the organization and flow of paper work for the new files, which are designed to handle mass records in large commercial, financial, and public utility organizations.

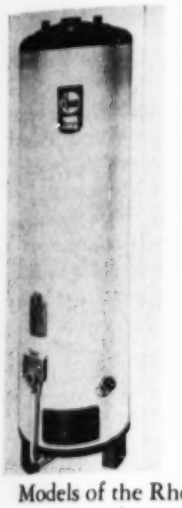
The new mobile console operating

control brings any record to operator's finger-tips within a few seconds. Two pull-out shelves materially increase work area, eliminating necessity of a separate desk for detail work. Two demountable trays are conveniently located for use as "in" and "out" baskets. The fourth accessory is a convenience compartment for the operator's personal use.

Diebold Inc.

■

7 Water Heater

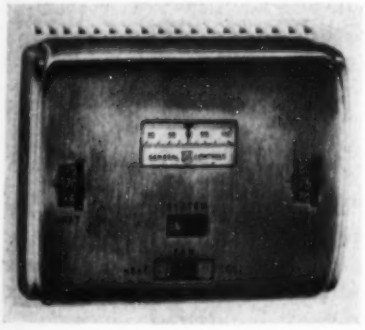


Rheen Manufacturing Co. has recently introduced a new line of glass lined water heaters, "Rheemglas" water heaters. Of special interest is the new type of "frit," the substance used in preparing the glass coating, which has been developed to provide a tough glass of great durability.

Models of the Rheemglas water heaters are available in 20-, 30-, 40-, 50-, and 85-gal. sizes; standards in 20-, 30-, and 40-gal. sizes.

Rheem Manufacturing Co.

■



8 Master Thermostat

An easily operated and convenient two-dial master thermostat for single-point control of summer-winter air conditioning systems has been developed by General Controls.

Designed for use with a millivolt heating circuit (B-60 type) and a 24-volt cooling system circuit, General's new thermostat features independent fan control for ventilation purposes.

The unit, designated the T-231B, has a satin-finished stainless steel cover and a television window view thermometer of bi-metal. The temperature selection

CHECK THESE ADVANTAGES:

- ☐ 12.6 mph mobility on rubber
- ☐ automotive steering
- ☐ truck-type hydraulic brakes
- ☐ digs up to 14½ ft. per min.
- ☐ 8 to 16 in. wide, 5 ft. deep
- ☐ positive down-crowd boom
- ☐ high-carbon cast-steel buckets
- ☐ easy-insert "Tap-In" teeth
- ☐ shiftable, reversible conveyor
- ☐ 43.6 h.p. gas engine
- ☐ 6-ft. backfill blade (optional)

Parsons rubber-tired 88 Trenchmobile is the low-cost answer on widely-scattered, small-yardage trenching jobs, where it costs more to move big equipment in and out than it does to move the dirt. This mobile trencher drives cross-town at 12.6 m.p.h. . . . digs house-to-street service connections at speeds up to 14½ feet per minute... drives on to next job without delay.

With its 8 to 16-inch cutting widths, and maximum depths of 5 feet, Trenchmobile is also big enough for main line excavations. It saves a lot of costly hand clean-up, too . . . undercuts sidewalks, curbs, gutters, mains . . . makes vertical set-ins flush with foundations . . . backfills its own trench (blade optional). Get the complete story from your Parsons distributor, or write us.

Want more facts? Write PARSONS CO., Newton, Iowa for bulletin on 43.6 HP 88 Trenchmobile

NAME _____

TITLE _____

COMPANY _____

DIVISION _____

STREET _____

CITY, STATE _____

P466 GAS

PARSONS Trenchmobile
(Koehring Subsidiary)

dials—one for control of heating temperature and the other for cooling—are located on the face of the cover.
General Controls Co.

■

9 End Wrench

A new Toledo end wrench has been designed with an offset handle to permit easy use on pipe in coils or against flat surfaces. It is made especially for rugged duty.

Features of the end wrench include a new type single spring that will not hang up on small sizes, an easy-action nut, improved sure-grip handle design, positive hook action. The wrench is available in 8-, 10-, 14-, and 18-in. sizes.
Toledo Pipe Threading Machine Co.

■

10 Utility Ditcher

A new crawler-mounted, ladder-type utility ditcher from Gar Wood Industries operates over all types of ground, including wet and unstable terrain, because crawlers provide high flotation and low ground bearing pressure.

A hinged crumber shoe folds back to allow digging up to foundation walls and for undercutting obstructions.
Gar Wood Industries Inc.

■

GAS trade literature

11 Pipe Coupling Bulletin

Malleable pipe couplings and fittings are described in a new 16-page bulletin from Gustin-Bacon. Thirty photos illustrate the couplings and fittings; diagrams and complete specifications are included.
Gustin-Bacon Manufacturing Co.

■

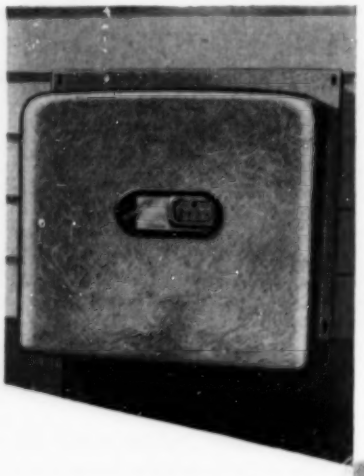
12 Infra-Red Heater Bulletin

Panelbloc gas-fired heaters that generate infra-red rays are described and illustrated in a new four-page bulletin from Prat-Daniel Corp. Complete specifications are included.
Prat-Daniel Corp.

■

13 Industrial Rubber Catalog

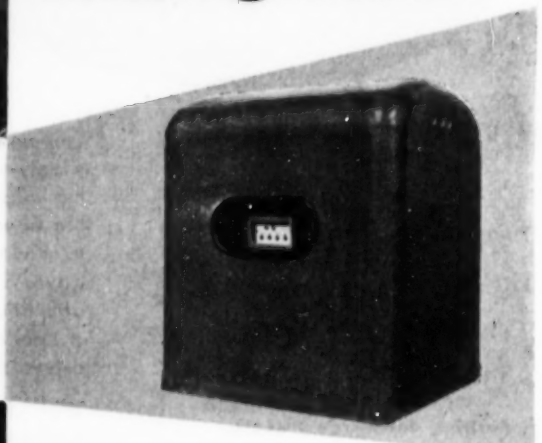
A new 58-page case-bound general catalog on industrial rubber products has been published by Quaker Rubber Corp. The catalog, which is divided into sections for quick references, contains performance data, specifications, charts on sizes, working pressures, weights, and all necessary technical information. It is fully illustrated and printed in color.
Quaker Rubber Corp.

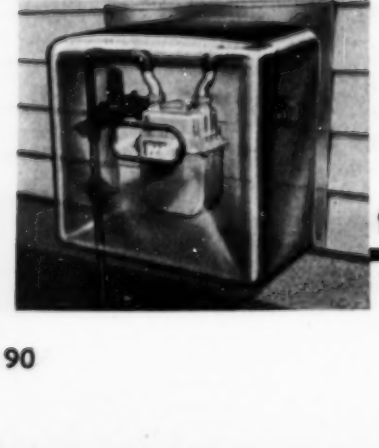


Yard model (right) sits directly on ground, with no rot or corrosion danger. Can be fastened to stakes. Wall model (above) has slots in flange, slips over screws.

Meter Dome

solves housing problems, cuts reading costs





Meter readers can make up to twice as many calls per day when sets are outside, and protected by a genuine one-piece Fiberglas Meter Dome. Emergency shut-offs are quicker, servicing is easier, annual painting is unnecessary, and installations are more economical.

Get the complete story today on money-saving plastic Meter Dome. It's your best buy in the meter cover field.

Transparent models (left) show roominess of Meter Domes. Either one easily holds any size domestic meter, meter bar and regulator.

the Buckeye Supply Co.

18 HARRISON AVE. • ZANESVILLE, OHIO

14 Dryer-Furnace Folder

Subject of a four-page folder from Herbster Products Co. is the company's Herbster Heat-N-Dry unit, which combines a gas furnace and clothes dryer into one unit. The brochure fully describes the clothes dryer, which is mounted on top of the furnace.

Herbster Products Co.

■

15 Compressor Bulletin

LeRoi's 85-cfm Airmaster compressor, which has been designed for smaller jobs, is illustrated and described in a four-page bulletin. Specifications are given for the compressor and engine. Tool capacities are included as well as weights and dimensions.

LeRoi Division.

■

16 Valve Circular

A comprehensive, completely illustrated circular describing Luncor, an all-molded PVC valve and fitting, has been published by the Lunkenheimer Co. The four-page folder describes the molding process that gives the PVC material exceptional strength and high corrosion resistance.

Lunkenheimer Co.

■

17 Precipitation Bulletin

Research-Cottrell Inc. has published a 28-page bulletin on its electrical precipitation equipment. The illustrated bulletin describes the general principles of electrical precipitation, and individual sections are devoted to its chief applications.

Research-Cottrell Inc.

■

18 Technical Bulletin

A new four-page technical information bulletin has been released by Carbide & Carbon Chemical Co. The bulletin (F-8085) discusses diethylene glycol and triethylene glycol.

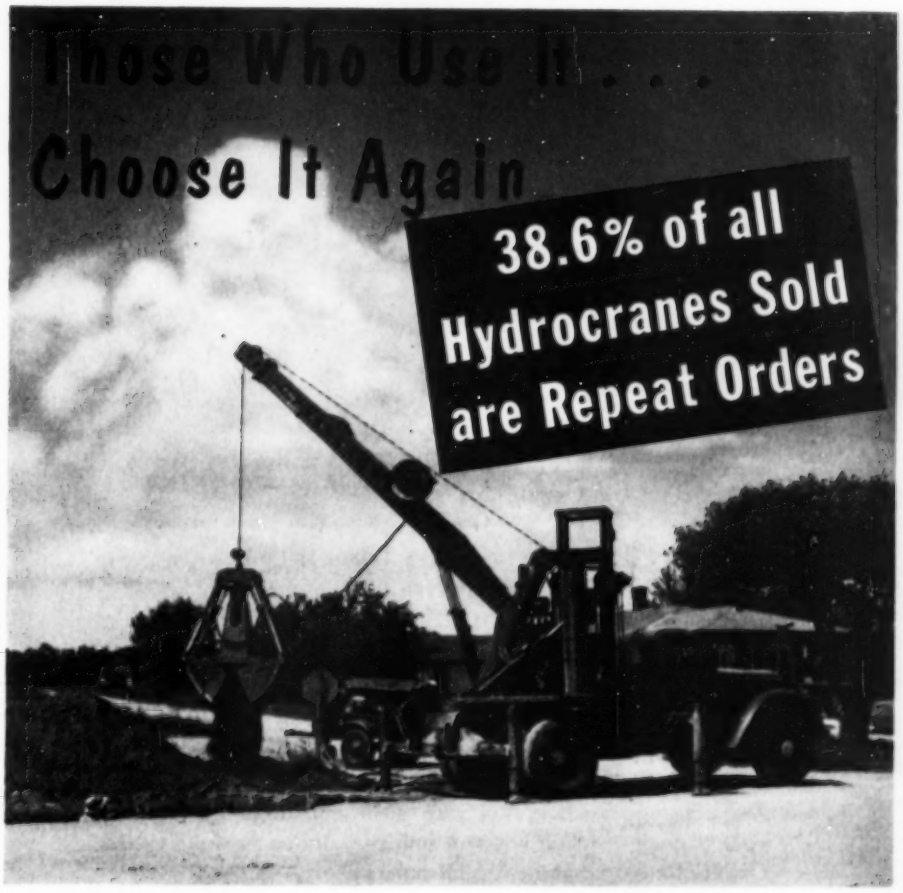
Carbide & Carbon Chemical Co.

■

19 Drilling Engine Bulletin

National Superior G-825 gas drilling engines are described in a new, illustrated eight-page bulletin (No. 427), published by the National Supply Co. Ratings are 535 bhp for the 6-cylinder engine and 705 bhp for the 8-cylinder.

National Supply Co.



Yes, 38.6 per cent of all Hydrocranes sold are additional machines bought by satisfied users. In fact, many owners are now fleet operators — buying a 3rd, 4th, 5th and even a 6th Hydrocrane! Here's real proof that this all-hydraulic truck crane produces big, gives owners an extra profit pay-off.

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- **Convertibility — quickly changed to dragshovel front end right in the field.**

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- **Self-power — Hydrocrane has its own independent power unit. (optional)**
- **Remote control — start it, drive it, turn it, stop it, right from the crane cab. (optional)**
- **Selector unit — foot control channels *extra* hydraulic fluid to hoist valve bank circuit — gives you 50% faster line speed. (optional)**
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- **New pressure relief valve — provides even better control of hydraulic pressure.**
- **Increased crane rating — maximum capacity now 4-ton with two-part hoist.**
- **Wrist-action dipper for Hydrohoe — provides variable digging angles . . . delivers extra digging power.**

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GAS

associations

PUAA plans forum on legislative trends

An educational forum of the Public Utilities Advertising Association will be held Feb. 10-11 at the Hotel Sheraton in St. Louis, Mo. Top people from the gas and electric industries will discuss current legislative matters affecting both industries.

Speaking for the gas industry will be John Ferguson of the Independent Natural Gas Association; Paul Kayser, El Paso Natural Gas Co., and J. J. Hedrick, of Natural Gas Pipeline Co. of America, will talk on the Phillips decision; John Merriam, Northern Natural Gas Co., and president of the INGAA, will talk on the three-way teamwork. In addition, Glenn Clark, Cities Service Gas Co. and chairman of INGAA's public information committee, will discuss the efforts of gas industry associations, and C. P. Rather, Southern Natural Gas Co., will tell of the coal industry's efforts to control natural gas.

Electric industry representatives will discuss atomic power, Niagara power, the Pacific Northwest and Southwest power picture.

Mid-West association will hold 50th annual meeting

The 50th annual meeting and convention of the Mid-West Gas Association will be held at the Hotel St. Paul in St. Paul, Minn. on March 7-9.

According to President M. B. Cunningham, Iowa Power & Light Co., the program will feature speakers from national associations, and executives of prominent manufacturing and sales organizations. In addition, there will be presentations of newest gas appliance developments, home service activities, and technical subjects.

Social events will include the annual banquet, scheduled for Tuesday evening, March 8, and an informal reception on Sunday afternoon and evening, March 6.

GAS people

Promotions

Five new officers have been elected by Boston (Mass.) Consolidated Gas Co. ANDREW W. JOHNSON is a new vice president; HENRY R. CONDON, FRANK L. CORCORAN, and M. FRANK KNOY are assistant vice presidents; and CLAUDE F. MACHEN is assistant to the president.

CARL SEGUIN has been promoted to process engineer in charge of cost reduction for American Thermometer Div. of Robertshaw-Fulton Controls Co.

HOWARD S. ROSE, a gasman for 52 years, retired last month as president of United Natural Gas Co., Oil City, Pa.

OLIN F. FLUMERFELT, president of Iroquois Gas Corp., Buffalo, N. Y., will retire this month. With the company 31 years, he has been president since 1943.

L. W. COUGHLIN has been named to succeed E. W. HODGES as comptroller of Pacific Gas & Electric Co., San Francisco. Mr. Hodges, who has held the post for 27 years, is retiring.

R. E. KRUGER has retired from Rochester (N. Y.) Gas & Electric Co. after 38 years of continuous service. Since 1950 he has been manager of research and development.

RICHARD J. PLANK has been elected a vice president of the Peoples Natural Gas Co., Pittsburgh. He will retain his duties as general superintendent of the firm.

R. J. Plank
Peoples Natural

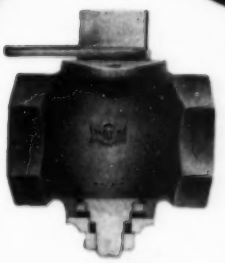
G. C. Perry
Crane Co.

GEORGE C. PERRY has succeeded J. T. YOUNG JR. as manager of Crane Co.'s Salt Lake City branch. Mr. Perry was formerly manager at Los Angeles.

A number of promotions and reassignments in the construction and distribution department of Southern Counties Gas Co., Los Angeles, have been announced. MONTE M. TEMPLE is superintendent of operation; C. F. BRIS-

IT PAYS TO BUY HAYS that are TOPS

7405
Iron Body, Galvanized, Bronze Plug Stop



7490
"Key-Lok" Tamper Proof Stop Lockwing—Iron Body, Bronze Plug

7500
Threadless Gas Stop Iron Body, Brass Plug

Service Line Stops—Meter Stops
Appliance Stops

Tamper Proof and Standard Patterns

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Black or Galvanized
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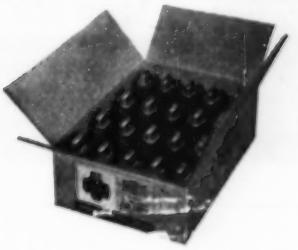
Quality Proven . . .
By Supplying the Gas Industry for Over 80 Years



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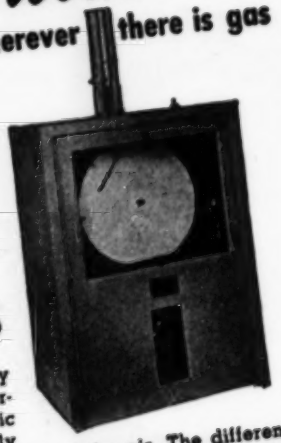
The World Over
wherever there is gas



ARCCO-ANUBIS
'Dry-Air GAS
GRAVITOMETERS

This new Arcco-Anubis Dry Air Gas Gravitometer determines and records specific gravity of gases automatically corrected to the humidity content of the air. The difference in weight between a column of GAS and equal column of DRY AIR is measured. This ratio represents the true specific gravity of the sample.

One bell of the instrument is filled with gas which is being measured, and the other bell is filled with dry air. Otherwise, except for the new instrument having one column for gas and one column for dry air, the unit is identical in operation to the standard gas gravitometer. When calibrated and properly installed, these instruments require little attention other than to wind the clock, ink the pen, and change the chart. Send for bulletin No. 101.

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people • *Continued*

COE, manager of distribution; W. C. MOSTELLER, manager, technical services; and H. A. SECOR, general shops manager. In addition, ROBERT W. WAMBSGANS is supervisor of distribution maintenance; EDWARD A. REPS, supervisor, distribution supply; EUGENE E. COWAN, supervisor, building maintenance; JOHN L. FOGARTY, supervisor, mapping and drafting. Under technical services, N. S. SENATOROFF is supervisor of special services; WILBUR L. MASHETER is supervisor of engineering design; and WARD C. ORVIS is supervisor of distribution design.

WALTER R. DWYER, formerly zone sales manager in the Pittsburgh area, has been appointed eastern regional air conditioning manager for Servel Inc. He will headquarter in New York.

CHARLES T. EVERETT, formerly executive vice president and general manager, has been elected president, general manager, and director of Beaver Pipe Tools Inc., Warren, Ohio.

HAROLD M. AITKENHEAD, formerly sales agent in the St. Louis, Mo., office of ACF Industries Inc., has been promoted to district sales manager of the office.

IVAN BALL, formerly chief accountant, has been elected controller and financial assistant to executives of Peoples Water & Gas Co., Miami, Fla. He will divide his time between Miami and New York.

GEORGE W. COULTER will head up Manufacturers Light & Heat Co.'s business and sales promotion activities in 1955. He succeeds ROBERT H. LOWE, sales manager, who resigned Jan. 1.

W. C. WAGGONER JR. has been elected secretary, treasurer and member of the executive committee of Florence Stove Co., Chicago, succeeding A. E. LUKE, who has retired after 30 years with the company.

WILFRED GATLING has been promoted to general manager of the Suffolk (Va.) Gas Corp. and G. A. BLACKWELL is superintendent of distribution.

RAY M. BALL has been appointed chief engineer of the Montana Power Co., Butte, succeeding H. E. CHAMBLISS. Mr. Chambliss will remain in a consulting capacity with the company.

RALPH MESERVE has been promoted to gas superintendent of the St. Paul (Minn.) division of Northern States Power Co.

E. C. MCANINCH has been promoted to the post of Tulsa district vice presi-

dent of Oklahoma Natural Gas Co. He is succeeded as manager of the Ardmore district by EARLE E. GARRISON; WAYMAN E. HUMPHREY, assistant district accounting manager in Tulsa, succeeds Garrison as manager at El Reno.

Lone Star Gas Co., Dallas, has promoted JOHN S. SUMMERS to the post of chief traveling auditor and BEN E. JOHNSTON, formerly inventory auditor, succeeds him as traveling auditor.

JOSEPH G. ZIMMER, supervisor in the apartment house, architect and builder section of the Peoples Gas Light & Coke Co., Chicago, has been promoted to assistant manager of the section.

In charge of new Bailey Meter Co. offices in Dallas and Memphis are F. D. KRUSEMARK and R. E. BYERS, respectively.

RICHARD E. CARPENTER has been promoted to chief production engineer of ElectroData Corp., Pasadena, Calif.

New faces

H. T. COGHILL has joined the sales staff of the Refractories division of the Carborundum Co., working in the Cincinnati territory.

H. T. Coghill
Carborundum

S. F. Martin
Hamilton

STEPHEN F. MARTIN has joined Hamilton Manufacturing Co., Two Rivers, Wis., as regional manager for home appliance sales in the metropolitan New York area.

WILL K. HOLMES has joined the sales staff of Master Tank & Welding, Dallas. He will specialize in the sale of anhydrous ammonia equipment.

RICHARD J. SMITH, member of a New York law firm, has been elected a director of the Connecticut Light & Power Co., Berlin, Conn.

KENNETH W. KAMPMAN has joined Sherman Products Inc., Royal Oak, Mich., where he will be responsible for development of new products.

20 Bell Holes Like This in One Day with a SHERMAN POWER DIGGER!

"Pay for themselves faster than most of our other equipment!" That's what R. Mannino & Sons, Westfield, New Jersey general contractors say about their Sherman Power Diggers.

A typical Mannino job was for the local gas company. Replacement of clamps and seals on gas mains required digging a series of bell holes. The Sherman Power Digger reduced digging time for the average bell hole to about fifteen or twenty minutes, making it possible to replace as many as twenty clamps a day.

If you now excavate by hand, or if your heavier equipment cannot work in tight spots, you, too, will find the versatile Sherman Power Digger practical and profitable. It's compact, flexible, fast, easy to operate. It digs in a fraction of the time and cost of manual labor—as deep as 10′ below grade in mud, hard-pan, shale, oiled roads, blacktop and stony ground.

Initial cost of the Sherman Power Digger is surprisingly low, maintenance simple and inexpensive. Write today for the whole story. Ask for Bulletin No. J-15.

Designed, Engineered and Manufactured Jointly by
SHERMAN PRODUCTS, Inc.
Royal Oak, Michigan
WAIN-ROY CORPORATION
Hubbardston, Mass.

Patent No. 2,303,852
Other patents pending
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Sherman
PRODUCTS, INC.
ROYAL OAK, MICHIGAN

GAS abstracts

DESIGN PROBLEMS AND APPLICATIONS OF HIGH-SPEED TURBINES—This paper by H. Steen-Johnson, chief engineer of the turbine division of the Elliott Co., was presented at the Petroleum Mechanical Engineering conference of the ASME in Los Angeles, Sept. 26-29, 1954.

A large portion of the steam turbines bought by industry are for direct drive of the driven machine such as pumps, compressors, paper mills, refrigeration machines, etc. Turbines used for these drives are referred to as mechanical drive turbines, and the horsepower spread is from 5-hp pump drives to 15,000-hp blast-furnace compressor drives and higher for special applications. These turbines may be single-stage or multistage turbines and with either single or multiple inlet valves and in this field there is a trend to multistage machines in the small horsepowers, taking advantage of the increased efficiency of the multistage turbine.

Looking at the turbine speeds, we find that the speeds cover a wide range, from 1200 rpm up to 10 to 12 thousand rpm. The majority of applications have been in the 2500- to 4000-rpm speed range but recently there is a growing demand for 3000- to 5000-hp turbines in the high-speed bracket; that is, from 7000 rpm up to say 12,000 rpm.

This demand for turbines originates with an increasing demand for compressor drives for refineries and other process industries such as steel-mill coke ovens, gas works, refrigeration and so on. Throughout there is an over-all increase in compressor applications to include higher pressure ratios and smaller volumes requiring higher rpm speeds. Also with the advent of the gas turbine, compressor design has received a lot of attention. New centrifugal and axial-flow designs have been developed and tip speeds have started up. Current designs go to 900 fps and higher. Indications are that they will move on up.

When we refer to turbine drives as high-speed turbines it should be kept in mind that it is not enough to talk about rpm and let it go at that. We built 12,000-rpm turbines 20 years ago for 700 hp and these machines are by no means comparable to the turbines we think of as high-speed machines today.

The rpm value has to be translated to the more specific term blade speed and it has to be evaluated together with steam flow to determine how much power is wrapped up in a small package.

Lancaster S-7 GROOVE TYPE METAL RIM DIAPHRAGM

Performance advantages of the Lancaster S-7 mean a closer to 100% overall accuracy — and an extra margin of profit. Patented Lancaster features and superior quality construction add up to more years of service in the meter — and another margin of extra profit.

If you are not using the Lancaster S-7 groove type metal rim diaphragm for your small meter repairs and replacements, write for a sample today.

Lancaster METER PARTS CO.

POST OFFICE BOX 378 • LANCASTER, OHIO

COMING . . . NEXT MONTH

Corrosion protection will be specially featured in March *GAS*, saluting the annual meeting of National Association of Corrosion Engineers in Chicago. These subjects will be covered at length:

An economic comparison of rectifiers vs sacrificial anodes . . .

A new device to facilitate tape-wrapping of distribution piping . . .

A study of today's holiday detection equipment and techniques . . .

Soil resistance as it affects corrosion control . . .

The story of plastic pipe, brought up to date . . .

Plus:

The first installment of the GAS symposium on digital computers . . .

Part three of the story on the piping code . . .

And many other important feature articles . . .

. . . all in March *GAS*.

GAS news

Utility rate control opposed in Minnesota

Proposed Minnesota legislation to provide for state regulation of gas and electric rates was opposed by a subcommittee of the State Legislative research committee.

"In the absence of any concerted demand for state regulation of gas and electric utilities in Minnesota," the subcommittee asserted, "the advantages which might be inherent in such statewide regulation would not justify the additional expenses involved."

The study group said that regulation of gas and electric rates by the state would involve extra costs irrespective of whether the State Legislature created a new agency to handle the job or broadened the jurisdiction of the present State Railroad and Warehouse Commission.

The subcommittee said the only request for such state regulation came from Red Wing in January 1953.

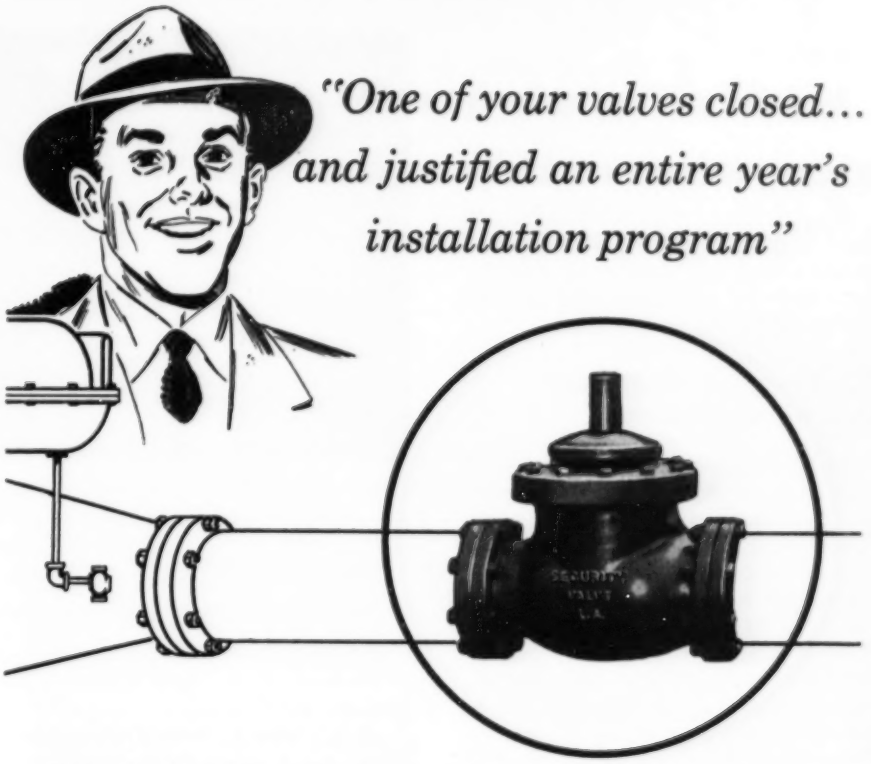
Minnesota now is one of four states in which utility commissions have no regulatory authority over gas and electric utilities, the study group reported. In Minnesota such regulation is left to cities and villages.

Purchase of NY & Richmond refused Kings County

New York's Public Service Commission has denied Kings County Lighting Co.'s application for permission to buy a controlling interest in New York & Richmond Gas Co. stock. At the same time, it dismissed, without prejudice, Brooklyn Union Gas Co.'s application to acquire control of New York & Richmond.

While the applications were before the commission, officers of Kings County, acting as individuals, bought the stock both companies wanted and assumed control of New York & Richmond.

In rejecting the Kings County application, the PSC held that the proposed purchase price of $123 a share for common stock was "at least 95% in excess of book value." BU had proposed about



"One of your valves closed... and justified an entire year's installation program"

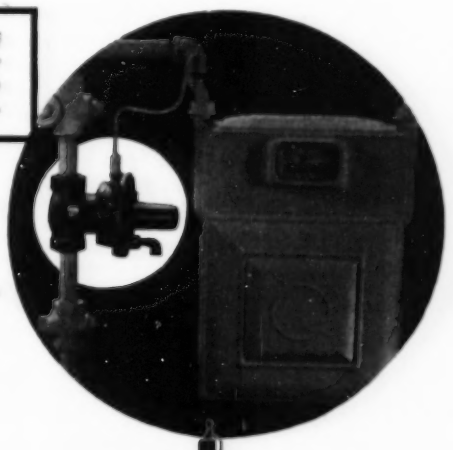
■ That's the experience of just one of the major gas companies and gas-using industries from coast to coast who have standardized on Security Automatic Shut-Off Valves. Because of their *absolute* protection against overpressuring, the operation of a single Security Valve can pay for a system-wide installation.

Security Valves are positive and always dependable . . . they are engineered for one specific function. Vital in congested areas, they eliminate both the expense and hazard created by high-capacity vent lines necessary when other over-pressure protection devices are employed.

A *complete* line, Security Automatic Shut-Off Valves are available in sizes ¾" to 12" for use on lines operating on inches water column to 1500 psig. They can be installed up or downstream of the regulator and controlled directly or by means of a pilot line.

Security Automatic Shut-Off Valves range from ¾" for domestic lines (right) to large distribution line sizes (above).

Nationwide representation insures fast help on your gas safety problems. Write today for the complete story and specifications of Security Valves.



SECURITY VALVE

SECURITY VALVE CORP.

541 W. GARFIELD AVENUE • GLENDALE 4, CALIF.

the same payment, along with an optional proposal to issue stock of its own in exchange for the New York & Richmond stock.

The principal opinion in the matter dealt only with Kings County, but a memorandum dismissal of the BU request included references to the Kings County ruling.

"Cadaver of facilities" free of regulation

Under the reasoning of the majority opinion in the Phillips case, "the Court has in substance said that only pipe and casing, etc., . . . the cadaver of facilities used in the production and gathering of gas is free from the (Natural Gas) Act but that the earning power of such facilities is subject to regulation," declared E. H. Selecman, assistant general counsel of the Shamrock Oil & Gas Corp. before a recent Panhandle Plains regional meeting of the NGAA.

Although feeling optimism to be justified, Mr. Selecman presented questions that would have to be answered if remedial legislation is not forthcoming:

"What position will you be in as producers and gatherers and how will you react selfishly to protect yourselves.

"How will the state conservation agencies react?

"What is the railroad commission of Texas going to say with respect to a new oil field as to the conservation of casinghead gas, particularly where no market exists for the gas other than to interstate carriers? Do you believe that the railroad commission would ever shut such a field in until the casinghead gas was sold to an interstate carrier? Do you think that the railroad commission is going to force Texas producers to sell their gas to interstate carriers and become federal utilities? Do you think the comparable conservation commissions of Oklahoma, Louisiana, Kansas and other producing states will act differently . . . ?

"The answer to these questions alone will deprive interstate pipeline carriers of one-third of their anticipated future reserves. This is about the ratio of the

Robert M. Wolff, gas construction superintendent for Arizona Public Service Co., Phoenix, shows off a trophy won by the gas department in 1954 for one million man hours worked without a lost time accident. Gas construction section heads and foremen of the company admire the trophy.

Leading gas companies have proved

the **Flotation Method**

of painting water-sealed gas holders

Your gas holders can look like this up to 3 times longer

2,000 Mcf Holder Flotation Painted

adds longer life, more protection and better appearance at less cost

Yes, the gas companies* now using the Flotation Method (Pat'd.) have proved it gives maximum protection and matchless appearance at minimum maintenance cost. In fact, savings of up to 65% are reported — and vast improvement in community relations.

Let us prove that the Flotation Method of painting can effect big savings for you by assuring a life of up to 3 times that of conventional methods. We are applicators of the specially formulated products of Aqua-Seal, Inc., with men thoroughly experienced in structural painting techniques.

**An impressive cross-section of this progressive industry. Names furnished on request. Call or write today:*

The Flotation Company, Inc.

715 Elizabeth Avenue Elizabeth, N. J. Elizabeth 4-5202

volume of casinghead gas from oil wells to the volume of gas produced from gas wells.

"What are you as independent producers and gatherers going to do about your situation?"

"... If you should foresee no other outlet for your gas but the sale to an interstate carrier, the chances are that if you are a little fellow you will not want to go into all the red tape. ...

"... If you are a major company with large income from other properties you could stand the siege. But if you are a small operator the chances are that you would not desire to sit this thing out during a long protracted period. Neither would you desire to become a utility. I predict that you will sell your property to a major company which could afford to maintain these properties until the proper market is obtained.

"What I am saying is that gas properties will more and more fall into the hands of major companies and to the same extent vanish from the holdings of the small independents."

"Save for remedial legislation, this all sums up as follows:

"Independent exploration of oil and gas will be reduced, the holdings of natural gas reserves by independent operators will drop and those of major companies will increase, the conservation of casinghead gas will be relaxed and construction of new gasoline plants will diminish; and

"In this struggle you will keep yourselves free from federal controls; your gas will find intrastate homes in new petro-chemical plants and in other industrial plants; your gas will enhance in value where its end-use is devoted to higher than heating purposes; and you will reap the profits of such a struggle."

Dresser Industries will acquire Lane-Wells Co.

Dresser Industries Inc., Dallas plans to acquire Lane-Wells Co., Los Angeles, supplier of oil and gas field services and products. Lane-Wells stockholders will meet soon to approve the plan.

Dresser Industries' president, H. N. Mallon, says the acquisition of Lane-Wells will "add substantially to that portion of Dresser sales represented by expendable products and services."

Lane-Wells management will continue in full operating control of the company.

SEC approves sale of Arkansas-Louisiana Gas

Cities Service Gas Co. has received SEC approval for the sale of Arkansas Louisiana Gas Co. for $24.4 million to W. R. Stephens Investment Co., Little

THE NORMAC

BELL JOINT CLAMP

A SIMPLE SOLUTION for one of the GAS INDUSTRY'S *most trying problems*

Solves Your Joint Repair Problems • Quick • Easy • Permanent

Installed in small pavement openings. Available in all standard sizes from 3" to 12". A simple set of tools cleans the joint, installs the clamp ... often in only a quarter of an hour. SAVES TIME, SAVES MONEY and the repair is permanent. Designed for all conditions particularly where pavement repair costs are prohibitive. Such small opening repairs are scarcely noticeable when pavement is replaced.

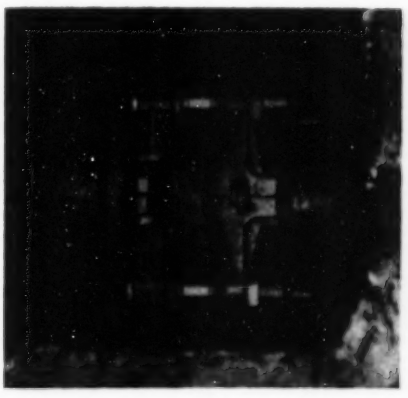
Normac Clamps can be installed in large as well as small openings.

Norton-McMurray hold definite leadership in the development of methods for installation and rehabilitation work through small openings. We welcome the opportunity to help solve a problem you may have—tell us about it.

Write for our catalog describing our complete line of

COUPLINGS ... FITTINGS ... SERVICE TEES and ELLS ... SLEEVES ... COMPRESSION-END COCKS ... METER BARS and BRASS FITTINGS for copper pipe.

6 inch Normac Clamp being lowered into hole for installation



6 inch Normac Clamp in service after installation

NORTON-McMURRAY MFG. CO.

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Method and product covered by U. S. Patents, Nos. 2,163,261 and 2,178,286.

"Pipe installation time and labor costs cut about 50% with Greenlee Pipe Pusher"

That's what a leading eastern utility reports as its experience with a GREENLEE Pipe Pusher on jobs as shown above. Let this remarkable tool make big timesavings and reduce job costs for you, too. With the GREENLEE Pusher, *one* man pushes pipe *under* streets, walks, floors, railways, lawns, etc. Eliminates extensive trenching and time-consuming tearing up, tunneling, backfilling, repaving. Often pays for itself on the first few jobs. Two models: No. 790 for pushing ¾" to 4" pipe; No. 795 for larger pipe and concrete ducts.

POWER PUMP for all models of GREENLEE Pipe Pushers. Makes the toughest pushing jobs simple, fast for *one man*. Average pushing performance: two feet per minute. Write today for complete details on timesaving GREENLEE Hydraulic Pipe Pushers.

GREENLEE

GREENLEE TOOL CO., Division of GREENLEE BROS. & CO.
1942 Columbia Ave., Rockford, Illinois

Rock. Cities Service holds 1,958,180 shares of Arkansas-Louisiana $5 per common, or 51.5%. The selling price is $12.50 a share.

Ten-million dollars of the proceeds from the sale will be invested in Cities Service Refining Corp. and the rest in Empire Gas & Fuel Co., Cities Service Gas subsidiaries.

The Stephens firm plans to sell the stock to the public, but before that it wants to transfer Arkansas-Louisiana's natural gas and oil production facilities and certain transmission lines to a new company to be organized in exchange for capital stock of the new organization. The total work of the plant is $104.9 million.

Stephens also wants to distribute the capital stock of the new company among the common stockholders of Arkansas-Louisiana. It will also sell to Mississippi River Fuel Corp., St. Louis, all of the capital stock of the new company which Stephens would receive as a stockholder of Arkansas-Louisiana.

Coalmen organize committee on competitive fuels

A special committee on competitive fuels has been named by the National Coal Association as the sole authoritative spokesman for coal producers on the controversial questions of oil imports and natural gas competition.

Among principles that will govern the action of the committee: It is against and will fight the dumping of natural gas at prices less than the average cost at the point of consumption, plus reasonable profit; and it is opposed to the importation of natural gas to prevent it from supplanting domestic fuels.

Flotation paint method used by Long Island

Long Island Lighting Co.'s 2 MMcf gas holder at its Bay Shore gas plant has been painted by the flotation painting method developed by the Flotation Co. of Elizabeth, N. J.

The total surface area of the four lifts, which are 34½ ft high each, is 60,000 sq ft. Actual painting time was 2.3 hours, not including the preparations, raising of the lifts, and removing the excess paint.

In flotation painting, the paint is pumped into the cups and floats on the water. A sufficient layer of paint is kept on the water as the lift is deflated of gas. The descent of the lift is timed at 1 ft per minute. When the lift has completely submerged, the operation is re-

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RICE HOTEL
HOUSTON, TEXAS

Home of the famous
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ONE MAN
Moves and Operates the EARTHRIPPER*

This truck-mounted self-levelling trenching machine requires only the truck driver to operate it. Hydraulically operated, except the bucket line; the truck engine supplies all power; controls can be operated from either a demountable seat or in bad weather from the truck cab. The wide range bucket line shaves off from ¼" to ½" with each row of teeth, leaving a clean, true ditch. The "EARTHRIPPER" digs to 8 ft. in depth and in width from 10" to 30".

O-P

• Write for folder which gives complete details

*PAT. PENDING

OWEN-PEWTHERS
Manufacturing Company
P. O. Box 540 • College Station, Texas

versed. The lift is inflated with gas and raised. The excess paint is then siphoned out of the cup off the top of the water. The operation is repeated with each succeeding lift.

Consumers meter facility now in operation

By the end of last month, when it was scheduled for full operation, Consumers Power Co.'s new general meter building in Jackson, Mich., was expected to be doing the great bulk of meter work, with the 16 other test centers being used mainly for emergency purposes and as bases for field-testing large power meters. Meter inspection, test and repair for Consumers out-state Michigan service area will be housed in the 42,000-sq ft building.

Previously, the company's more than 1,125,000 meters have been processed in the 16 other test centers scattered over the company's 63-county service area. Now, more than 800 electric and 330 gas meters a day will go through the scientific test and repair cycle.

Water, air, and manual tests on gas meters, according to Adolph W. Rauth, general meter superintendent, can go through the cycle in about two hours. The overall effect is a process of test and inspection three to six times as rapid under the new system.

Sections of the new building are devoted to meter records (where 1,125,000 names of Consumers customers will be on file), and to storage, safety device testing, and time-switch testing.

Social Security changes may alter pension plans

A recent informal survey of nationally known companies made by Johnson & Higgins, international insurance brokers, revealed that more than 70% of the companies planned no changes in their pension plans to take into account the 1954 Social Security amendments.

J&H warns that by not adjusting for changes in the Social Security laws where necessary, employers run the risk of "creating serious inequities within the plan and of establishing a precedent which may cause difficulties in the future."

Here are some of the questions J&H urges management to consider before deciding whether to take action and what action to take:

1. Will a company's pension plan plus Social Security provide higher or lower benefits than is provided by other companies in a given field or labor market.

2. Will higher paid employees now receive less pension benefits propor-

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25 FEATURES

that give a new meaning to "UTILITY"

Model 900 D with upper structure

1. Models to fit 40 different Chevrolet, Ford, International, GMC, Dodge and Studebaker chassis . . . single or dual wheel.
2. For ½ - ¾ - 1 - and 1½-ton trucks.
3. 18 different compartment arrangements.
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10. Embossed door panels for rigidity and appearance.
11. Fully recessed door handles.
12. All doors keyed alike.
13. Tumbler-type locks at no extra cost.
14. Full bolt-action locking bar.
15. Weatherproof compartments . . . lap-seal and gutter drain on all doors.
16. Raised bottoms of all vertical compartments provide extra protection for tools and supplies.
17. Heavy-duty reinforced 16-gage bulkheads.
18. Outside compartment headers 14-gage steel.
19. 4-way, 12-gage, safety tread non-skid floor.
20. From 25 to 35 sq. feet of floor loading area.
21. Through wheel housings for universal dual wheel application.
22. Reinforced tailgate.

Model 1050 D

23. Extra strength, bridge-type construction with interlocking lateral and longitudinal reinforcements.
24. Side boxes supported by one-piece cross members, reinforced at mounting holes.
25. Beaded fender panels hinged for easy access to wheels and spring shackles.

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• Also manufacturers of MOR-SUN Furnaces and ROLY-DOOR Steel Garage Doors

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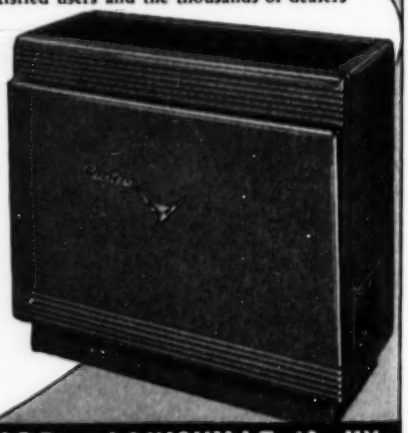
WITH THE LOW BOY LOOK

These *new* Heaters are *new* inside and out . . . with stimulating styling that sells . . . plus more engineering achievements that surpass all others.

Truly a triumph in beauty . . . styling . . . finish . . . performance . . . economy and engineered perfection . . . A trifle more in cost but twice the value . . . yet priced for the mass market.

There's no better proof of Peerless superiority than the countless thousands of satisfied users and the thousands of dealers enjoying satisfying profits — year in and year out — and protecting their reputation as well.



More and more dealers everywhere are switching to Peerless because of complete customer satisfaction. Sell what they're asking for . . . sell Peerless.

Sizes and styles for every need . . . plus automatic controls . . . automatic power blowers . . . Write today for colorful, descriptive literature.

Remember the name that sells — it's Peerless . . . for over 70 years.

PEERLESS MANUFACTURING CORP., LOUISVILLE 10, KY.

BORE with HYDRAUGER
(EARTH BORING MACHINE)

Designed for maximum control of the reamer. Earth along the pilot bits acts as a bearing to steady the reamer assuring an accurate hole.

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HY-250

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Please send, without obligation to me, the HYDRAUGER BOOKLET which shows relative costs and speeds of BORING as well as specifications of various Hydrauger models.

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tionately than lower paid employees?

3. What effect will increased Social Security benefits have on future pension negotiations?

4. Will the cost of a pension plan coupled with increasing Social Security taxes prove unduly burdensome in the future?

5. If increased Social Security makes possible cost savings, should these savings be used to provide other employee benefits?

6. Will failure to amend a pension plan make it difficult to amend it for future Social Security increases?

The insurance firm points out that answers to these questions will vary from company to company but that each question should be studied carefully with the company's pension advisers to determine what action should be taken.

CEC will market analysis and control instruments

Phillips Petroleum Co., Bartlesville, Okla., and Consolidated Engineering Corp., Pasadena, Calif., have concluded an agreement under terms of which Consolidated will manufacture and market continuous plant analysis and control instruments developed by Phillips.

The instruments proposed for immediate marketing include infrared gas analyzers, differential refractometers, ultraviolet analyzers, and oxygen analyzers. These electronic and optical devices have been used over the past several years in many large manufacturing plants to fill specialized requirements in the petroleum and petrochemical processing fields. Housed in explosion-proof enclosures, all of these devices are capable of continuous and automatic control of such operations as fractionation, blending, and chemical synthesis, to improve product quality and increase yields.

Maryland revises gas regulations

Revision of rules for utilities supplying natural and manufactured gas has been approved by the Maryland Public Service Commission. The first major revision since 1936, it was prepared by G. R. Faust, assistant chief engineer of the PSC, who said the new rules reflect changes in the industry due to the increased use of natural gas and propane products.

Utilities will be required to file with the PSC a statement of policy in adjusting customers' bills when waste is incurred with the customer's knowledge

For its contribution to the progress and development of the Pittsburgh community, Equitable Gas Co. was awarded a commemorative plaque by the Pittsburgh Chamber of Commerce recently. Displaying the award are D. B. Beecher, vice president and general manager (left), and A. W. Conover, president, Equitable Gas.

and provide that customers be given six weeks in which to pay by installments any deposit charges of more than $25.

Also, gas companies must adjust their bills if meters have registered more than 2% too fast if the amount of over registration exceeds $1; if the utilities fail to check meters at 14-year periods, the adjustment can be tabulated to include all over the period beyond the 14-year mark.

New standards are also set for testing gas, and utilities are required to set forth a definite gas detection program as a safety measure.

Rockwell announces winners in meter contest

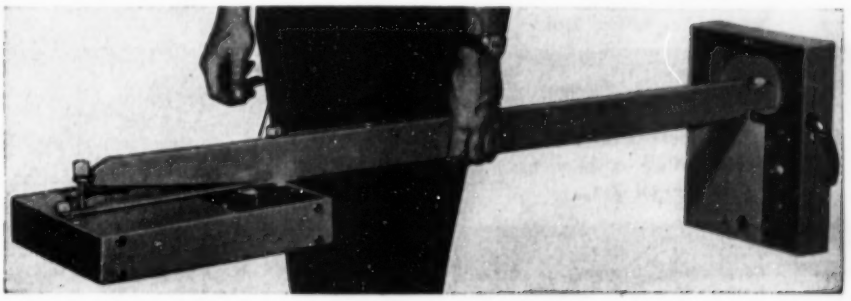
Twenty-seven winners in a nationwide essay and jingle contest on planned meter retirement programs in the gas industry have been announced by Rockwell Manufacturing Co. Winners will receive prizes ranging from individual Delta Homecraft power tools to an entire "shop" of Delta industrial-type power tools.

First prize winner in the essay division was G. K. Backmann, Public Service Electric & Gas. Second prize went to Douglas L. McLeod, Coast Counties Gas & Electric (recently merged into Pacific Gas & Electric). Honor awards went to Anton G. Prasil, Wisconsin Public Service; J. M. Pickford, Northern Indiana Public Service; Donald J. Heim, Washington Gas Light; and C. V. Morey, Consolidated Edison Co.

Honorable mention winners: Adolph W. Rauth, Consumers Power; C. Alkema Jr., Michigan Consolidated; S. H. Glassburn, Northern Indiana; Eugene

THE WILKINSON LINE LOCATOR

A precision instrument for detecting the position and depth of any sub-surface pipe, cable, stub, valve, coupling, etc.



The dependability of the Wilkinson Line Locator is amply attested by its wide use. Leading gas, oil and pipe line companies generally KNOW its value.

WILKINSON PRODUCTS COMPANY

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REED DU-ALL CHAIN WRENCH

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J. Kuhns, United Gas Improvement; James H. J. Hughes Jr., Brooklyn Union; J. Gordon Cree, Boro of Chambersburg; S. J. Fisher, Mountain Fuel Supply; and W. F. Bennett, Atlanta Gas Light.

In the jingle contest, H. H. Sexton, Houston Natural, was first-prize winner and D. U. Wheaton, Southern California Gas, won second prize. Jack R. Davis, also of SoCal, took third place.

Ten honorable mention winners include Howard L. Johnson, PG&E; Walter M. Trevor, Coast Counties; Ed Rad, PG&E; Victor B. Gallant II, SoCounties; Bill G. Lewis, Coast Counties; Henry Hartmann, Brooklyn Union; D. M. Steen, Long Island Lighting; Charles H. Foinx, Central Hudson Gas; Roscoe R. White, Hope Natural; and Stuart Talbot, Peoples Gas Light.

Affiliated consolidates operating facilities

In a move to consolidate operations following completion of defense contract commitments at its Cleveland (Ohio) plant, Affiliated Gas Equipment Inc., has sold this manufacturing facility to the Eaton Manufacturing Co. of Cleveland. In recent years the principal activity at this plant has been production of defense material.

Affiliated has re-leased the office portion of the Cleveland facility and will maintain its general offices there. Also scheduled to remain in Cleveland are the Bryant Heater division sales and engineering offices.

Harvey said sale of the Cleveland plant is the last step in a program begun sometime ago to combine Affiliated's production facilities into a more efficient manufacturing and distribution operation.

Training sessions stress conversion of boilers

Architects, heating engineers, and plumbers are taking advantage of a unique series of training sessions conducted in Columbus by Ohio Fuel Gas Co. to study problems arising in the conversion of large boilers to natural gas.

Shortly before the series started several months ago, Ohio Fuel lifted restrictions on use of gas, bringing many conversions of boilers to gas fuel. With the host of conversions came a host of problems: Variables in heat load, heat loss, make, age and condition of the boilers were virtually as numerous as the number of boilers converted. To help provide the answers, Ohio Fuel instituted the series of training sessions as a public service.

Four sessions have been held so far and each time the Ohio Fuel warehouse room, which is the largest the company has available for the school in Columbus, has been filled with from 80 to 112 men.

Meetings are held about a month apart with additional classes scheduled over the next several months. Each session is devoted to a different phase of converting boilers to gas firing, with a guest speaker for each.

The first meeting centered around electronic controls, with representatives of Minneapolis-Honeywell Regulator Co. conducting. The second meeting had the general manager of Webster Engineering Co., L. S. Reagan, discussing large boiler conversions. An engineer from the division of smoke regulation and inspection of the Columbus department of public safety spoke on choosing the right conversion burner at the next meeting.

GAS news notes

Virginia's state supreme court will have to decide whether eight natural gas companies operating in the state should be allowed to include escalator clauses in their rate schedules. The City of Norfolk is reportedly prepared to appeal the ruling of the state corporation commission that permits such inclusion.

Fourteen deaths from carbon monoxide fumes in Cincinnati last year are resulting in demands at city hall for a "get tough" policy with building owners and those who install unvented heaters. Under consideration is a move to provide more inspectors, and to educate the public to the dangers of faulty heaters. Some councilmen, however, favor a study that might lead to outright condemnation of all unvented gas heaters sold and in existence prior to March 5, 1954. On this date, the present ordinance was passed, prohibiting sale and installation of unvented gas heaters, under penalty of fine up to $500.

Daubert Chemical Co. is the new name of the Nox-Rust Chemical Corp., Chicago, manufacturer of rust preventive products and automobile undercoatings.

Electro Rust-Proofing Corp., Belleville, N. J., has opened a new division office in Atlanta under the supervision of R. B. Mills division manager, and J. A. Lehmann, division engineer.

American Meter Co., Philadelphia, reports that the Philadelphia Pump &

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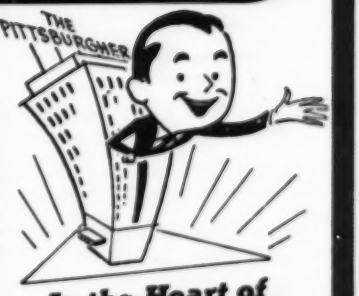

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GAS calendar

February

4..SGA Work on Consumers' Premises Conference — Biltmore Hotel, Oklahoma City.

11..NEGA Manufacturer - Distributor Division — Hampshire House, Boston.

13-15..24th Annual Mid-Winter Conference of Public Utility Buyers' Group, National Association of Purchasing Agents — Shamrock Hotel, Houston.

23-24..PCGA Seminar on Electronic Data Processing — Los Angeles.

25..NGAA Permian Basin Regional Meeting—Scharbauer Hotel, Midland, Texas.

March

2-3..PCGA Home Service Conference—Santa Monica, Calif.

4..SGA Transmission Management Conference—Shamrock Hotel, Houston.

7-9..Mid-West Gas Association—St. Paul Hotel, St. Paul, Minn.

7-11..National Association of Corrosion Engineers — Palmer House, Chicago.

9-10..PCGA Customers Service Conference—Carmel, Calif.

16-17..PCGA Home Service Conference—Santa Monica, Calif.

17-18..SGA—Jung Hotel, New Orleans. Accounting Management Conference; Distribution Management Conference; Sales Executive Conference.

23-24..PCGA Accident Prevention Conference—Santa Barbara.

24-25..NEGA Annual Meeting — Hotel Statler, Boston.

24-25..Oklahoma Utilities Association Convention — Mayo Hotel, Tulsa.

April

28-1..Western Metals Congress and Exposition—Los Angeles.

7..Southeastern Gas Association Sales & Advertising Roundtable Conference — Selwyn Hotel, Charlotte, N. C.

12-14..AGA Sales Conference on Industrial & Commercial Gas —Hotel Statler, Boston.

12-15..AGA Distribution, Motor Vehicles & Corrosion Conference — Netherland Plaza, Cincinnati.

13-15..NGAA 34th Annual Convention — Baker and Adolphus Hotels, Dallas.

14..GAMA Sixth Annual Automatic Gas Range Conference —Hotel Pierre, New York.

14..Southeastern Gas Association Supervisory Training Roundtable Conference — Wade Hampton Hotel, Columbia, S. C.

18-19..AGA Residential Gas Section, Eastern Natural Gas Regional Sales Conference—Hotel William Penn, Pittsburgh.

19-20..PCGA Distribution Conference—Phoenix, Ariz.

19-21..Southwestern Gas Measurement Short Course—University of Oklahoma, Norman.

20-22..Indiana Gas Association Annual Meeting — French Lick Springs Hotel, French Lick, Ind.

25-27..National Conference of Electric and Gas Utility Accountants — Conrad Hilton Hotel, Chicago.

25-27..Mid-West Regional Gas Sales Conference—Edgewater Beach Hotel, Chicago.

28..Southeastern Gas Association Transmission & Distribution Roundtable Conference — Selwyn Hotel, Charlotte, N. C.

May

1-4..LPGA Annual Convention—Conrad Hilton Hotel, Chicago.

2-6..AGA Industrial Gas School—Hotel William Penn, Pittsburgh.

9-10..AGA Gas Supply, Transmission & Storage Conference—William Penn Hotel, Pittsburgh

12-13..Public Utilities Advertising Association—Sheraton Hotel, Chicago.

16-18..Southern Gas Association — New Orleans.

17-19..Pennsylvania Gas Association —Pocono Manor Inn, Pocono Manor, Pa.

23-25..AGA Chemical, Engineering & Manufactured Gas Production Conference — Hotel New Yorker, New York.

June

5-9..Canadian Gas Association Annual Meeting—Sheraton-Brock Hotel, Niagara Falls, Ontario.

news notes • *Continued*

Machinery Co. Inc., manufacturer of chemical porportioning pumps and controlling equipment, has become a subsidiary. Joseph A. Eagan will remain as president of the new subsidiary.

Forty-two sales engineers have been added to the field sales force of Minneapolis-Honeywell Regulator Co.'s industrial division in 25 branch offices located in 23 U. S. cities and two Canadian cities. At the same time, 18 service engineers were also added to the firm's sales force.

Enrollments in the Institute of Gas Technology home study course, "Natural Gas Production and Transmission," and sales of the text as a reference work, passed the 1000 mark in December, less than two years since the course was first made available. Shortly after this milestone was passed, the 150th Certificate of Accomplishment for satisfactory completion of the course was issued.

The Burden-Bryant Co., Springfield, Mass., has been named distributor for Servel gas and electric appliances. The company will serve Berkshire, Franklin, Hampden, and Hampshire counties in Massachusetts and the entire state of Vermont.

Sears, Roebuck & Co. will offer a gas dryer of 38,000-Btu capacity this spring. Drying time on the new units will take about half as long as on current models, the company said.

General Electric Co. will market five additional models of ranges in color this year. Previously, when GE announced its new line for 1955, it said it would market two lines of ranges in five colors, besides white. However, because of advance response to the 1955 line of color appliances, the firm has expanded its color lines.

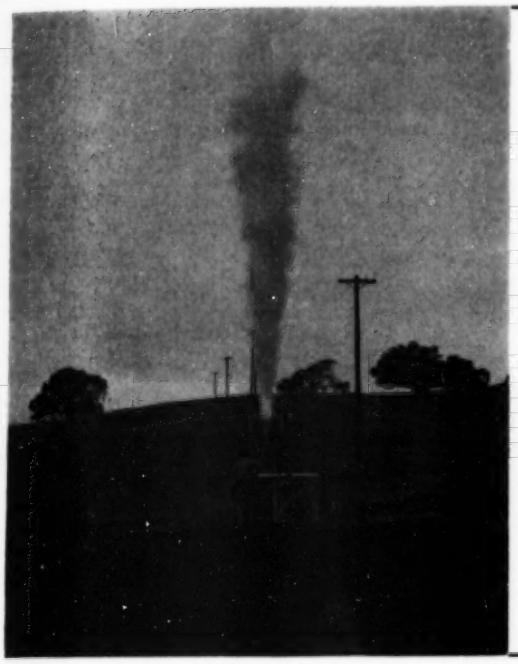
Shelton (Wash.) Gas Co. and Cascade Gas Corp. will merge, according to Stewart Matthews, president of Cascade, in order to provide new opportunities for the development of the Olympic peninsula both industrially and residentially. The merger of Shelton into Cascade, approved by the Washington PSC, brings to 17 the total of operating utilities merged into Cascade.

A basis for merging the National Radiator Co., Johnstown, Pa., and United States Radiator Corp., Detroit, has been approved by directors of both companies. Stockholders of the companies will be asked to approve the merger at special meetings to be called.

GAS

FEBRUARY 1955

The proper sizing of blowdown valves is very important. Too small a valve will slow down the venting process while a large valve is uneconomical. As a means of finding the proper size quickly, the author has worked out a nomograph. (See page 110.)



Twelve-in. valve, opened north of spot where Super Inch was joined by northern terminus of 27-mile loop, emits gas at pressure of 525 psi. Three such valves along an 8-mile stretch were opened to depressurize the line so that the loop could be placed.

BLOWDOWN CHART

By B. C. SHEBEKO, Associate Design Engineer
Pacific Gas & Electric Co., San Francisco

GAS exclusive

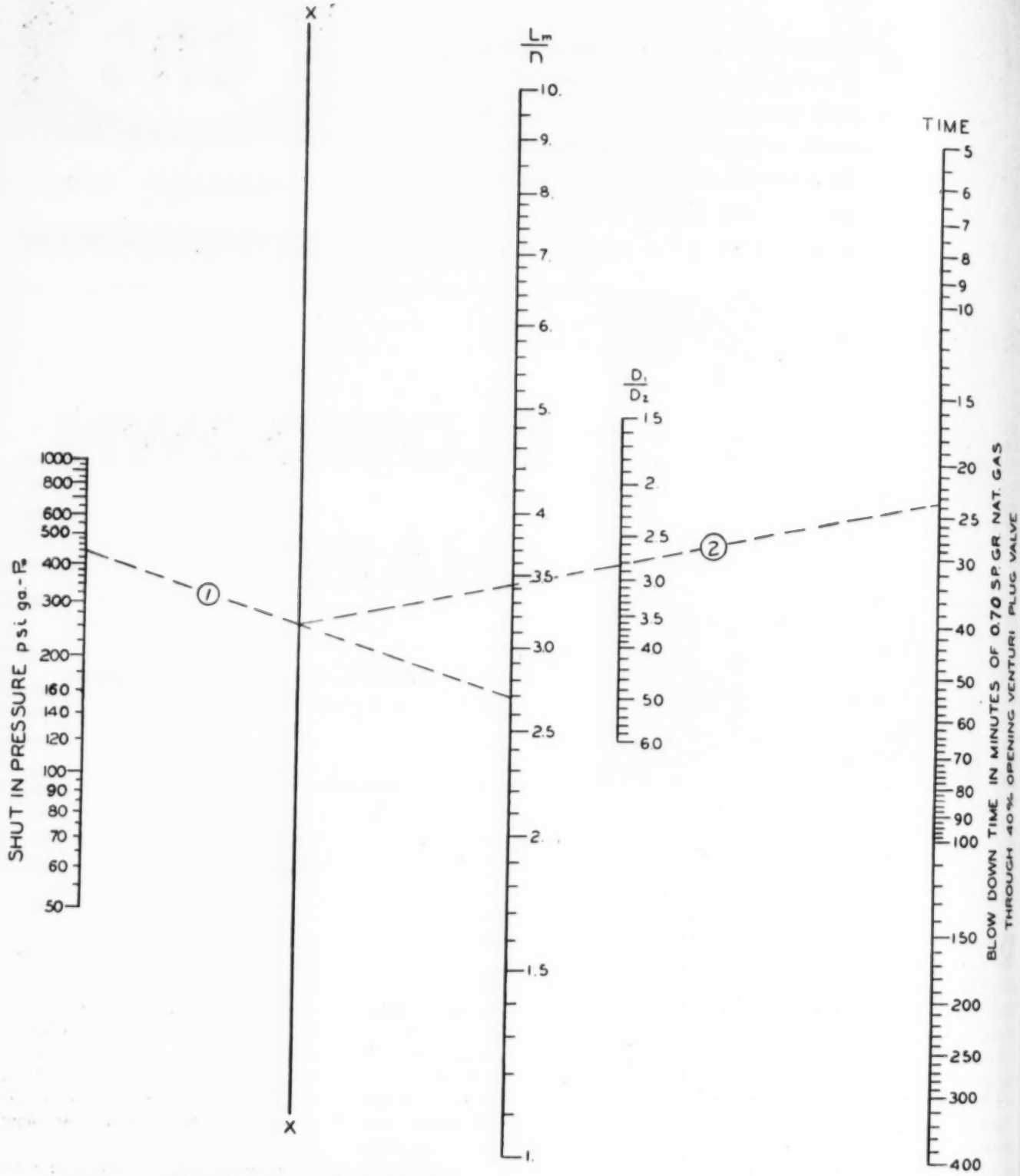
WHEN designing high pressure gas transmission lines and compressor stations, one must provide facilities for exhausting gas from the system. Transmission lines are normally sectionalized by valves placed at strategic points so that sections may be isolated for maintenance or construction.

Economics of modern design tend to concentrate a major portion of the total gas supply for a system in large diameter transmission lines. For example, the 34-in. Topock-Milpitas gas line owned by the Pacific Gas & Electric Co. carries more than 50% of the total gas supply of the system. It is imperative that shutdown be held to a practical minimum time in order to protect the supply and to reduce the standby of the pipeline crews. For this reason the blowdown valves on the Topock-Milpitas line were sized so that any section could be isolated and blown down in about 30 minutes.

Consideration must also be given to blowdown time in compressor station design. The added fire hazards of machinery and personnel require that the blowdown time be kept to a minimum consistent with good economy and plant operations. Automatic shutdown stations should be placed outside the plant area so that, should the need arise, the compressor system can be vented from a remote control point.

Physical arrangement of the blowdown valve and stack may vary from a close-coupled mounting directly above the main to a stack exhausting at some distance through a lateral pipe. In either case tests indicate that the difference in elapsed time is negligible if the blowdown pipe does not exceed 100-110 ft. An exception is noted when the blowdown starts with pressures in the main of less than 100 psi. The proper sizing of blowdown valves is, therefore, very important. Too small a valve will slow down the process of venting while a large valve is uneconomical. When attacking this problem, it is well to visualize the "dynamic" changes that occur during the blowdown period.

When the section of the main is isolated by the closure of sectionalizing valves, the pressure eventually equalizes. As the blowdown valve is opened, the gas within the section expands and rushes through the throat of the valve with the local velocity of sound, the magnitude of which will depend upon the ratio of specific heats of a given gas. In passing through a minimum section of the throat, the gas flows with a constant velocity, determined by the prop-



Lm = LENGTH OF LINE IN MILES
n = NUMBER OF BLOW-OFFS
D_1 = INTERNAL DIAMETER OF MAIN LINE
D_2 = INTERNAL DIAMETER OF BLOW-DOWN LINE

BLOW DOWN TIME FOR PIPE LINES THROUGH 40% AREA PLUG VALVE

erties of the fluid, and at an absolute pressure that is a fixed proportion of the absolute pressure in the main. Thus the gas flows with unchanging velocity until the absolute pressure in the main falls to a certain limit.

When this lower limit is reached the so-called "critical flow" ends, and a radical change occurs. From then on the velocity diminishes gradually and tends to reach zero, which, in theory, it never does. In practice it may be assumed that the velocity is zero when the pressure falls to atmospheric. Since, during this period, all changes occur within a short space with little friction and little opportunity for heat transfer, this period of flow closely follows adiabatic laws. The total elapsed time of blowdown is, therefore, the summation of time consumed in "critical" flow and adiabatic flow. The analytical solution of this problem is tedious and time-consuming. The resulting equation is too unwieldy to be of any practical use. However, by the use of certain assumptions, a more simple formula may be arrived at

$$t = 0.01382 \frac{a_1}{a_0} \frac{Lm}{c} \sqrt{TS} \, (\log_{10} P_0 - 1.05)$$

where

- t = time of blowdown in minutes
- a_1 = internal area of main pipeline, sq in.
- a_0 = area of valve throat, sq in.
- Lm = length of mainline in miles
- c = coefficient of discharge
- T = absolute temperature of gas in mainline, ° F
- S = specific gravity of gas (air = 1.00)
- P_0 = pressure ahead of valve, psi absolute

The results obtained by use of this formula are quite consistent with the actual time recorded.*

The alignment chart shown enables one to calculate the blowdown time in a few seconds. In the preparation of this chart, the following conditions were assumed: The chart is based on a 40% area plug valve. For any other percentages of opening, the time obtained on the chart should be multiplied by $\frac{40\%}{\%\ \text{Opening}}$. However, when the time is given and the size of the valve is desired, the given length of line should be multiplied by $\frac{40\%}{\%\ \text{Opening}}$ and this new value must be used on the Lm/n scale. The temperature of the gas and specific gravity are assumed 60° F and 0.70 respectively. The accompanying examples will demonstrate the application of this chart.

*For those interested, the derivation of this formula is available from Mr. Shebeko, Pacific Gas & Electric Co., 245 Market St., San Francisco.

Mr. Shebeko received a B.S. degree in civil engineering from the University of California in 1929. In the same year he was employed by PG&E where, at the present time, he is an associate design engineer, in supervising capacity, in the engineering department. As an employee of the company, he made extensive studies in the fluid flow field, which resulted in the development of his Polyflo computer, which is now widely used in this country and abroad. For this work, he was awarded two major prizes by PG&E's suggestion committee.

Mr. Shebeko was born in Russia and received his primary education in a military school in Moscow. After the overthrow of the Imperial government, he fought in the civil war against the Bolsheviks, first in southern Russia in the armies of General Denikin, and later in Siberia in the armies of Admiral Kolchak. After the defeat of the White armies, he was interned in China. He entered the U. S. in 1923 and became a citizen in 1929.

EXAMPLE 1:

How long will it take to blow 8.05 miles of 33.125-in. ID pipe containing 0.70 sp. gr. natural gas at 60° F and 440 psig through three 12-in. 40% opening plug valves? The inside diameter of blow off pipe is 11.75 in.

Solution:

$$D_1/D_2 = \frac{33.125}{11.75} = 2.82 \qquad Lm/n = \frac{8.05}{3} = 2.68$$

Connect 440 on pressure scale with 2.68 on Lm/n scale [dotted line (1)] and mark the point of intersection on X-X line.

From this point draw a line through 2.82 on D_1/D_2 scale [dotted line (2)] and read 23.6 min. on time scale.

EXAMPLE 2:

Required: the size of two 60% opening plug valves to blow 10-mile section of 23.5 ID main in 30 minutes. The pressure is 700 psig. The temperature of gas is 60° F and its sp. gr. = 0.70.

Solution:

Multiply length by $\frac{40\%}{60\%}$

$$Lm = 10 \times \frac{40\%}{60\%} = 6.66$$

$$Lm/n = \frac{6.66}{2} = 3.33$$

Connect 700 on pressure scale with 3.33 on Lm/n scale and mark the point of intersection on X-X line.

From this point draw a line through 30 on time scale and read 2.7 on D_1/D_2 scale.

The size of valve is therefore $\frac{23.5}{2.7} = 7.7$ in. or use the nearest size, 8 in.

SUGGESTED WORKSHEET FOR CALCULATING METHANOL REQUIREMENTS

	Quantity	Units	Instructions	Example
(1)	Average line pressure	Psia	Field data	1000
(2)	Hot temperature at which gas was saturated with water**	°F	Field data	80
(3)	Cold temperature at which line must be protected from hydrates	°F	Field data	40
(4)	Water content of hot gas**	lb/MMcf	Using (1) and (2) find from Fig. 1	34
(5)	Water content of cold gas	lb/MMcf	Using (1) and (3) find from Fig. 1	9
(6)	Change in water content	lb/MMcf	(4) minus (5)	25
(7)	Gas flow rate	MMcf/day	Field data	1.5
(8)	Water condensed in the line	lb/day	Multiply (6) x (7)	37.5
(9)	Gas gravity	-	Field data; calculated from gas analysis	0.7
(10)	Hydrate temp. of gas	°F	Using (1) and (9) find from Fig. 2	65.1
(11)	Freezing point lowering required	°F	(10) minus (3)	25.1
(12)	Wt. percent methanol in liquid	percent	Using (11) find from Fig. 3	25.9
(13)	Vapor to liquid composition ratio	lb/MMcf Wt. Percent	Using (1) and (3) find from Fig. 4	1.0
(14)	Gas methanol concentration	lb/MMcf	Multiply (12) x (13)	25.9
(15)	Methanol to saturate liquid	lb/day	$\frac{(8) \times (12)}{100 - (12)}$	13.1
(16)	Methanol to saturate gas	lb/day	Multiply (7) x (14)	38.8
(17)	Methanol injection rate	lb/day	(15)+(16)	51.9
(18)	Methanol injection rate (pure MeOH at 77°F)	gal./day	$\frac{(17)}{6.55}$	7.92

**If undersaturated, use dew point temperature

By ROBERT H. JACOBY
Consulting Engineer
Stanolind Oil & Gas Co., Tulsa

By employing the curves presented in this article, a field operator can use a worksheet similar to this to quickly figure methanol requirements.

Calculation of methanol requirements to prevent formation of gas hydrates

While the use of methanol to prevent formation of hydrates is limited to a certain rather narrow range of situations, it does have its place; and for the operator's use, a more scientific method of determining requirements would seem advantageous.

With this thought in mind, the editors asked Robert H. Jacoby, Stanolind research engineer, to adapt for publication in GAS the essential elements of an extensive paper which he presented before the 1953 gas hydrate control conference at the University of Oklahoma. The result is a set of curves which can be used to determine volume requirements with a minimum of calculation and a maximum of speed.

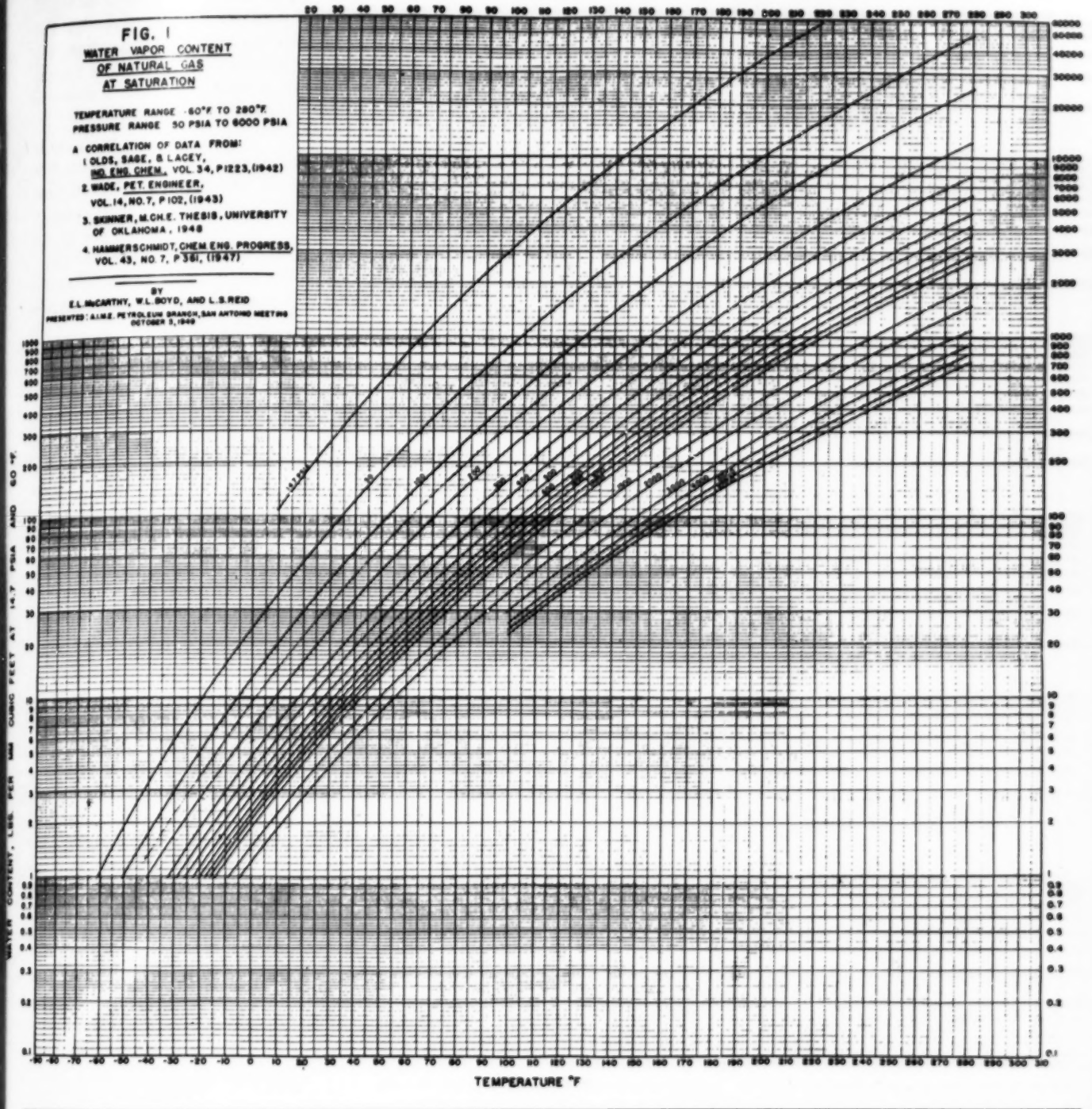


FIG. 1
WATER VAPOR CONTENT OF NATURAL GAS AT SATURATION
TEMPERATURE RANGE -60°F TO 280°F.
PRESSURE RANGE 50 PSIA TO 6000 PSIA
A CORRELATION OF DATA FROM:
1 OLDS, SAGE, B. LACEY, IND. ENG. CHEM., VOL. 34, P1223, (1942)
2. WADE, PET. ENGINEER, VOL. 14, NO. 7, P 102, (1943)
3. SKINNER, M.CH.E. THESIS, UNIVERSITY OF OKLAHOMA, 1948
4. HAMMERSCHMIDT, CHEM. ENG. PROGRESS, VOL. 43, NO. 7, P 381, (1947)
BY
E.L. McCARTHY, W.L. BOYD, AND L.S. REID
PRESENTED: A.I.M.E. PETROLEUM BRANCH, SAN ANTONIO MEETING OCTOBER 3, 1949
WATER CONTENT, LBS. PER MM CUBIC FEET AT 14.7 PSIA AND 60 °F.
TEMPERATURE °F

PRESENT-DAY use of methanol to prevent formation of gas hydrates in natural gas pipelines is determined by its economy in certain situations. The cases in which it may be desirable are:

(a) Where low gas volumes prohibit the use of other means which require high investments in equipment.

(b) Where installations are temporary and it is desired to defer decision on permanent gas handling equipment.

(c) Where hydrate troubles are relatively mild or infrequent.

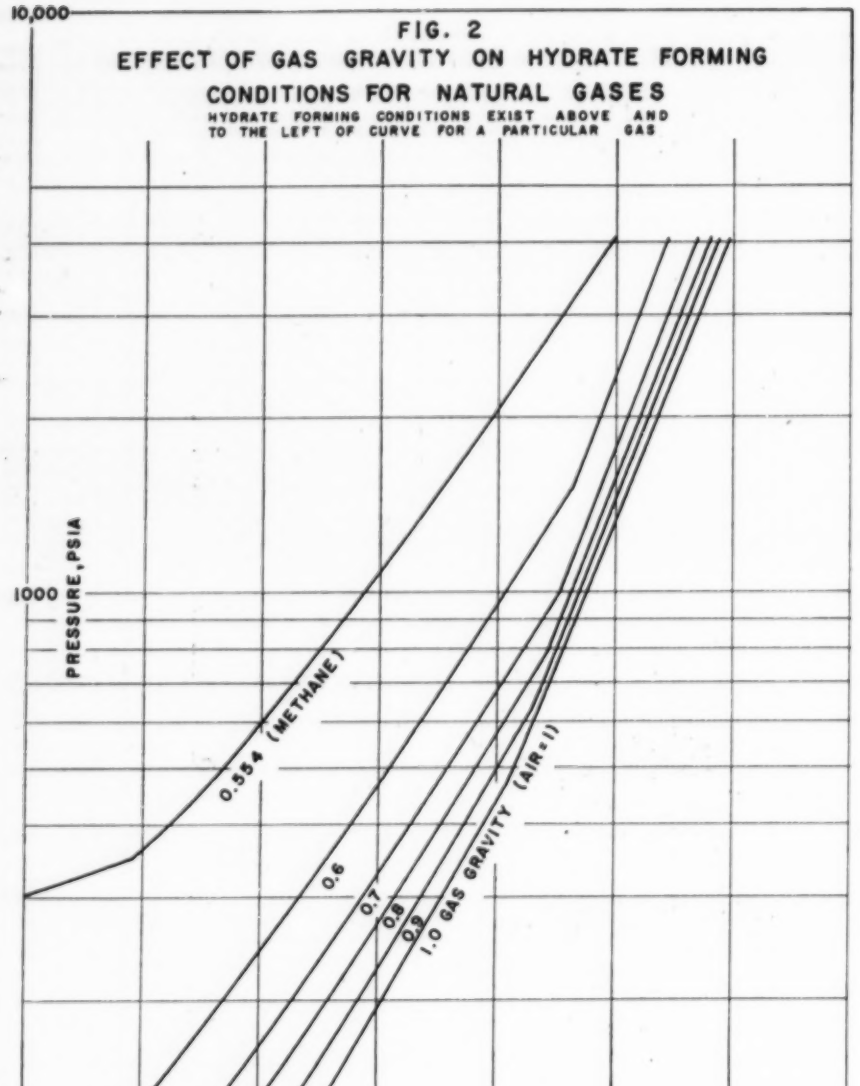
These situations are presented mostly by lease and field gathering lines where pressures may be 1000 psi or greater.

The calculation of the rate of methanol injection necessary to prevent hydrate formation in a given line is based on P-T-X equilibrium data for natural gas-water systems and for natural gas-methanol-water systems. These data are scattered throughout the technical literature, but have been assembled here for handy reference. In one case a small amount of experimental data were obtained in order to substantiate an extrapolation of some previously published data.

The field data needed for the calculation are line pressure, gas flow rate, gas gravity, warm temperature at which the gas leaves a separator, and the cold temperature of the point where hydrates tend to form.

Known requirements

The methanol requirement consists of two parts: that required to maintain a prescribed concentration in the liquid water phase which condenses in the line, and that required to saturate the gas so that it will be in equilibrium



with the condensed water containing methanol.

In brief, the water which will condense in the line is calculated from the difference in saturated water content of the gas from warm to cold point (using *Fig. 1*). From the hydrate formation temperature of the gas *(Fig. 2)* the necessary methanol content of the liquid phase becomes known *(Fig. 3)*. The methanol content of the gas phase may then be found from *Fig. 4*. The calculation for a simple example is shown in the worksheet.

Some refinements may be made in the calculation of condensed water flow rate at the cold point, if more data from the field are available. For example, drip points may remove some of the water before it reaches the cold point. Such a correction would affect the minor part of the methanol requirement, however.

Actual hydrate temperature

Probably the most important factor that enters into the calculation is the actual hydrate temperature of the gas in question. Wherever possible, field observation should be used to check temperatures predicted by any generalized correlation or calculation method. The hydrate temperature affects the methanol requirement for both gas and liquid phases and could introduce a fair error.

There are numerous other factors that may possibly be accounted for, but to account for them would require more P-V-T-X data and more data from the field installation before methanol requirements could be evaluated. In view of the fact that, very often, field practice consists of dumping in methanol until hydrates are removed from the line, the calculation method and data employed here seem to constitute a fairly simple and reasonable approach. ■

References

Fig. 1 is reproduced from McCarthy, Boyd and Reid, *AIME Trans.* 189 p. 241 (1950).
Fig. 2 is reproduced from D. L. Katz, *AIME Trans.* 160 p. 140 (1945).
Figs. 3 and 4 were developed from the basic data of E. G. Hammerschmidt, preprint of a paper given at 1939 Tulsa meeting of the natural gas section of the American Gas Association.

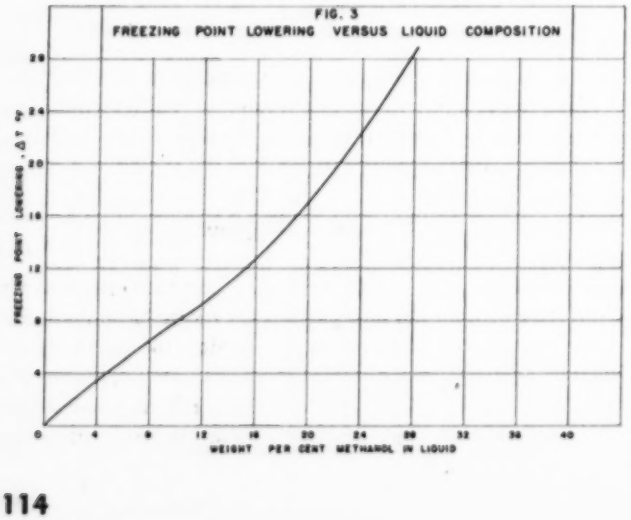
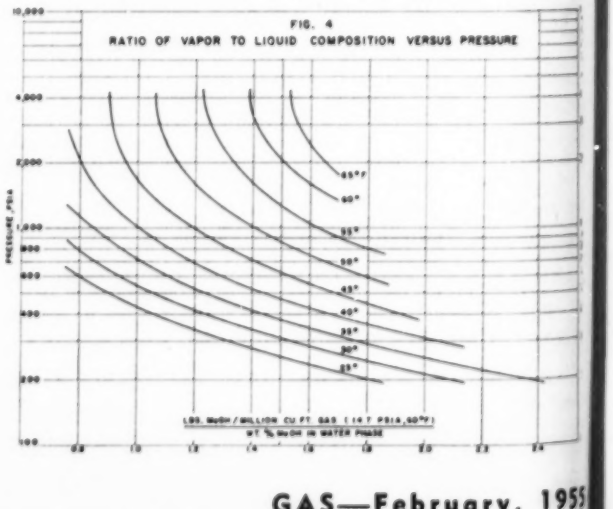


FIG. 3
FREEZING POINT LOWERING VERSUS LIQUID COMPOSITION
FREEZING POINT LOWERING, Δt °F
WEIGHT PER CENT METHANOL IN LIQUID



Whether a plant is used for natural gas gathering, recycling, or one of the many other services requiring gas compression, the fundamental conditions are generally the same. The compressor plant under discussion here includes conventional gas-powered horizontal reciprocating compressors that require normal operating utilities.

Factors to consider in designing a compressor station

By HENRY S. FARNSWORTH, Project Engineer
Fluor Corp. Ltd., Los Angeles

ONE of the first and major considerations in planning a compressor plant is the engine-compressor foundation block. This structure, if properly designed and installed, may eliminate a large portion of the mechanical vibration so often present in compressor plants. Of particular note, in proportioning a well-designed engine-compressor foundation, is the fact that the concrete block should be shallow and wide, rather than high and narrow. This insures the minimum lever arm between the centerline of the horizontal forces of the compressor unit and the center of gravity of the concrete mass *(Fig. 1)*.

Shallow blocks are not always possible or practical. This is particularly true where compressor house basements are needed. In such cases, compensating design characteristics have to be emphasized. However, the minimizing of a large proportion of mechanical vibration at its source is usually possible by the correct proportioning of the required mass in the foundation. The normal ratio of mass to the horizontal forces should increase as the height of the block increases.

The piping system can be the source of many operating difficulties within a plant. Good planning may eliminate some of these troubles.

Operating block valves, such as those controlling the gas suction and discharge, should be placed close to the compressor units they serve, with the engine fuel and starting air valves conveniently close. These items are fundamental, yet the gas block valves are frequently located a great distance apart or at comparatively inaccessible points in the header area. This is particularly true in multiple-stage compressor systems. With such complex piping, careful planning is necessary to insure an easily operable arrangement of valves.

Where plug cocks are used, clearance should be provided for pulling the plug out of the body without removing the whole plug cock from the line.

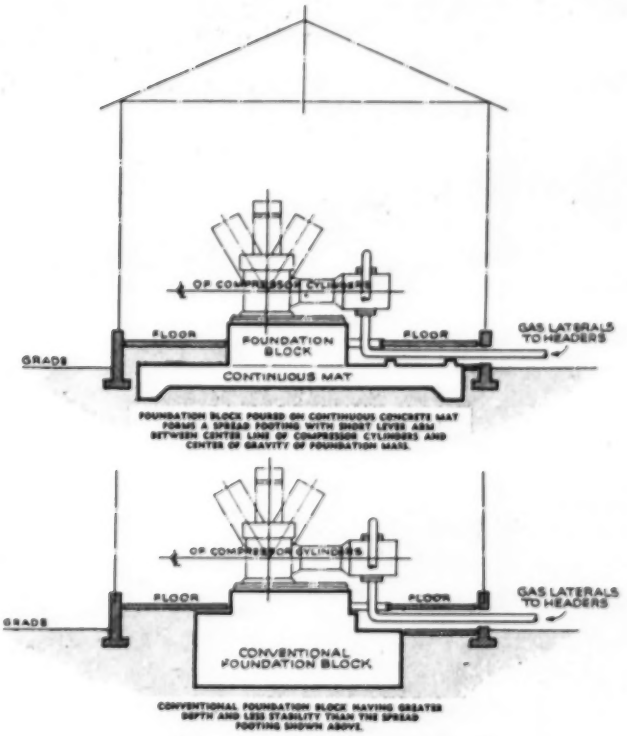


Fig. 1. Comparison between a conventional engine-compressor foundation block and a block poured on a continuous concrete mat. The well-designed engine-compressor foundation should be shallow and wide rather than high and narrow.

This article has been adapted from a paper presented before the annual fall meeting of the CNGA in Los Angeles in October 1954.

Compressor stations ... It is difficult to determine the cause of vibration in the piping

One of the newer layout principles applied to gas plants is the location of piping above ground and as close to grade as practical. This arrangement has many advantageous features, chief among which is the ease with which pipe runs may be secured to concrete sleepers, thereby tending to diminish any mechanical vibration. Many of the earlier compressor plants included overhead, loosely supported gas suction and discharge lines. Excessive vibration and the difficulty in supporting them made these lines a source of annoyance and danger.

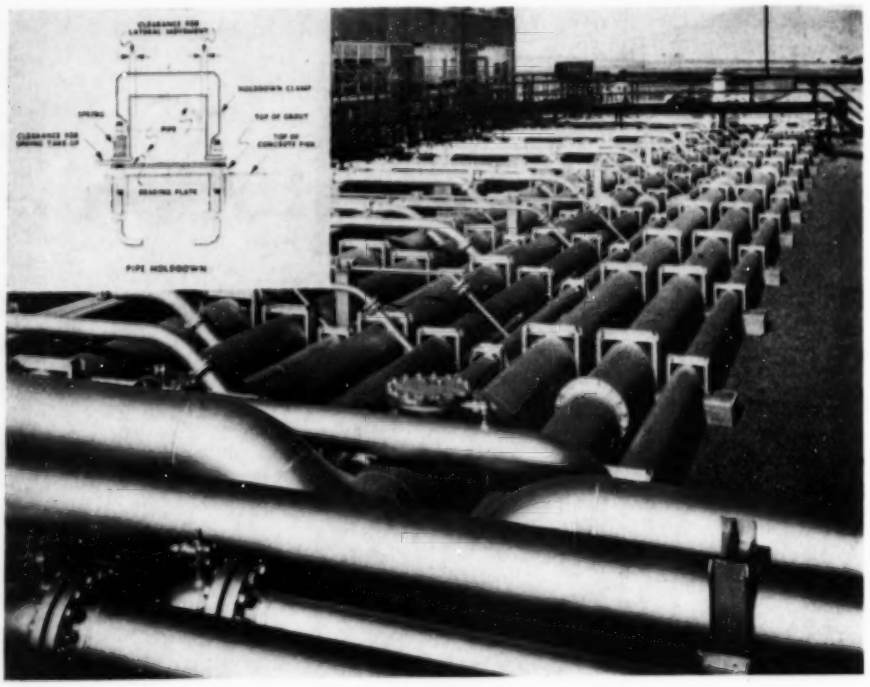


Fig. 2. Typical header system with hold-down clamps in place. Section of hold-down detail is shown by insert.

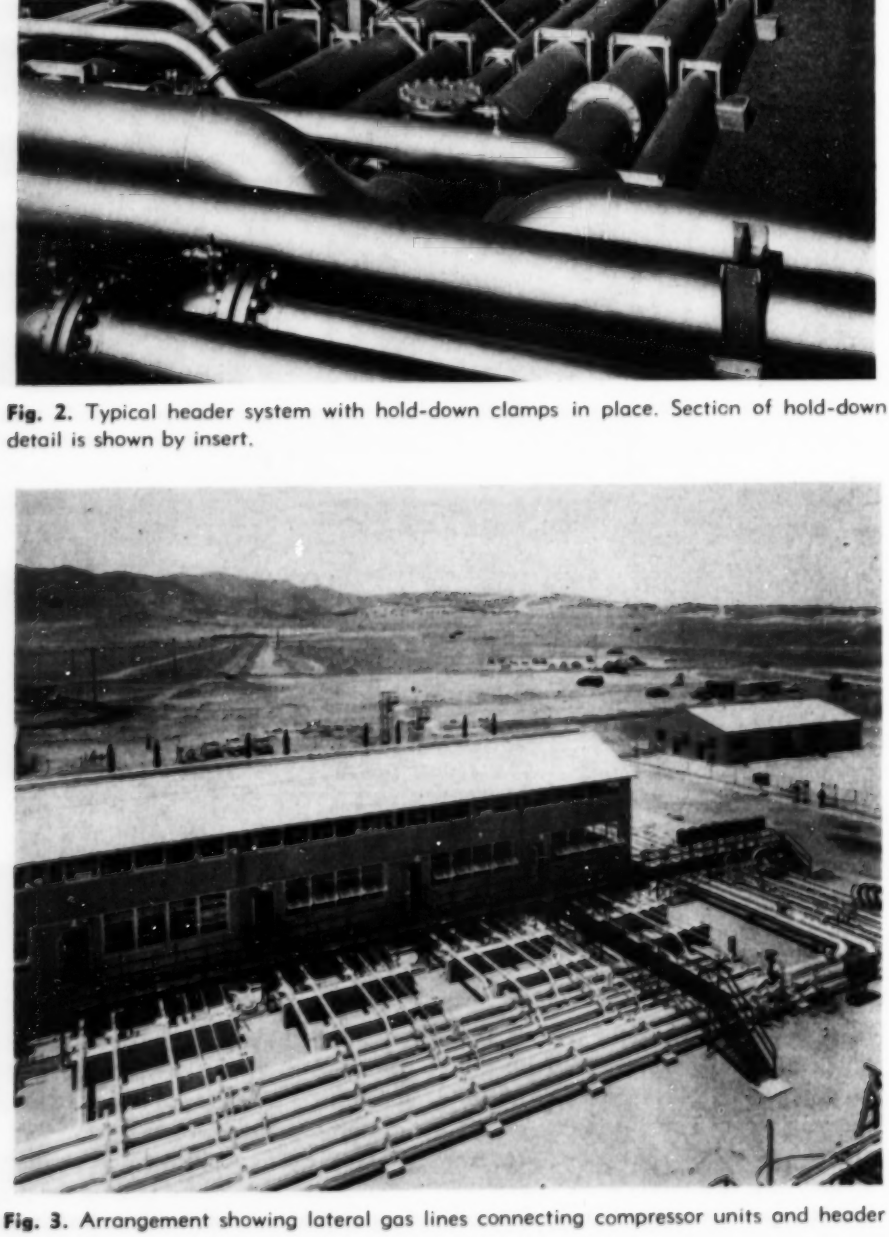


Fig. 3. Arrangement showing lateral gas lines connecting compressor units and header system.

Another type of vibration inherent in gas compressor systems is that associated with pulsations in the gas flow. In most cases it is difficult to detect whether the vibrations existing in the piping systems are caused by pulsations in the gas stream or from unbalanced mechanical forces. Pulsations in the gas stream have been detected by "pinching" either the gas suction or discharge valves at the compressor cylinders, to take a pressure drop across the valve of about 10% of the operating pressure. If there is no noticeable decrease in vibrations after applying this pinching operation, it may be assumed that the vibrations are transferred from mechanical forces. Where two or more compressor cylinders are involved, the pinching must be performed on all the valves feeding from or into a common header.

Pulsation gas flow has several bad features in addition to the obvious structural difficulties arising from its vibration. These are:

1. Difficulty in obtaining accurate orifice meter measurements.
2. Difficulty in controlling by conventional regulator valves.

The usual method of reducing pulsations in the gas stream are:

1. Installing dampeners or pulsation dampening systems.
2. Using adequately sized volume bottles.
3. Increasing the size of gas lines.

Experience indicates that the only readily predictable means of reducing pulsations in the gas stream is to install a pulsation dampener, designed and manufactured for this purpose.

An older means of reducing the effects of pressure pulsations is by increasing the pipe diameters. This is usually accompanied by the installation of volume bottles, preferably connected to the compressor cylinders. Whereas increasing the pipe sizes as a means of reducing gas velocities and effecting more rigid conduits has, in many instances, eliminated vibration to some degree, it still has not always offered a positively predictable means of overcoming the vibration problem. This same condition also seems to hold true for volume bottles.

A complete scientific explanation would be too complicated for use here.

The simplest explanation is that the pulsation dampener must contain two elements, a volume and a restriction. The combination must be sized properly. In certain special cases improper proportions put the system in what is called resonance, which increases rather than decreases the effects of pulsations. This may be the reason why arbitrarily increasing the sizes of volume bottles sometimes results in amplifying the problems that are associated with pulsations, rather than minimizing them.

The gas lines or headers, both on the suction and discharge sides of the compressor cylinders, should be adequately secured near the ground on piers of sufficient mass to absorb the transferred vibrations. The lateral lines between the compressor cylinders and gas headers are usually comparatively short, and concrete piers extending up from the compressor foundation can be used in conjunction with the supports required outside the building.

Among numerous hold-down clamps used for securing pipe to piers is a proven device now manufactured by one company for this purpose. *Fig. 2* shows a typical gas header system with hold-down clamps of this design in place, together with an insert showing the detailed model. This clamp has spring tension to allow longitudinal movement of the pipe and side clearance for lateral movement. The single spring also provides a certain amount of vibration dampening.

If the plant consists of multiple compressors, the gas suction and discharge headers are likely to be rather extensive in length. Ordinarily located outside the compressor building, they should be supported at intervals sufficient to reduce deflection to a practical minimum *(Fig. 3)*.

A further consideration is the desirability of varying the pipe spans between supports to help reduce synchronous vibration. N. H. Moerke and C. Newman[4] have suggested that these supports be placed at varying distances within a range of about 10% above and below the calculated maximum span of pipe, so that adjacent spans will be supported by piers having different spacing. If the calculated span is 15 ft, the adjacent span could be about 16 ft on one side and 14 ft on the other side.

The subject of mechanical vibration, due to the movement of machine parts and of pulsative forces in gas streams, has been a constant problem throughout the history of gas compressor design and operation. Several papers by M. L. Arnold,[3] also Moerke and Newman,[4] have explored these problems with conclusions based on calculations and actual tests.

Linear expansion within the piping system, due to varying temperature, is an important consideration. In many instances, sufficient flexibility has to be provided in the piping runs in order to eliminate excessive stresses in the pipe. For example, in planning the installation of suction and discharge laterals between the compressor cylinders and the main gas headers of a multiple compressor plant, the headers would normally be anchored at the midpoint in length. During the period of startup, or during a rise in the operating temperature of the flowing gas, the headers will expand in length away from the anchor points, with resultant bending in the lateral lines. Control of stresses may be accomplished by designing lateral lines with sufficient length pipe, applied either as straight runs or as expansion bends.

Points at which gas lines having any degree of pressure are restrained in any way should be secured by clamps or U-bolts. This is in preference to clips welded to the pipe. If it is necessary to resort to welded clips on pressure lines, the applied stresses and design features should be carefully considered, since, as we have already stated, some degree of vibration is usually present in the gas system.

Adequate drain valves, properly located in the bottom of gas headers, are a very important requirement. The lack of these items often results in the accumulation of condensed liquids which may well carry over into the compressor cylinders, with dangerous results. This can conceivably happen in long intake headers between gas coolers and compressor cylinders, even though gas scrubbers are in place.

The low side of gas headers should be free from all types of ridges or obstructions to flow, such as welding slag and screwed pipe ends, that might cause condensate to collect. In such cases the condensate could be highly corrosive to steel pipe.

Common practice seems to indicate that the gas headers should be grouped on one side of the compressor building and the utility lines on the other side. This procedure helps to keep the gas area free from possible obstructions in arranging a safe and operable gas piping system. The advantage is more pronounced in the case of multi-stage compression units.

A very important feature that may well be considered in planning the piping system in the provision for blowing out the gas headers before actual startup of the plant. This requires that all the gas headers be provided with blind flange ends where they would otherwise be blanked off with welding caps. An arrangement of this type allows air or gas to be exhausted through the headers to purge them of slag and other foreign particles.

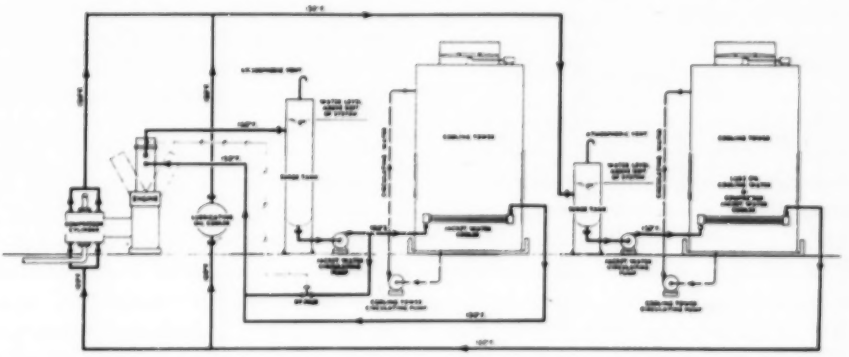


Fig. 4. Jacket water flow including two circulating systems—one for the engine power cylinder jackets and a colder system for the lube oil cooler and compressor cylinder jackets.

Cooling water system

During the days when engine-compressors had massive sections and slow moving parts, large streams of jacket water at comparatively low temperatures were used and it was frequently the rule to use open cooling water systems. With the development of engines and compressors, tending toward greater speeds and higher jacket water temperatures, corrosion and jacket scaling have become greater considerations

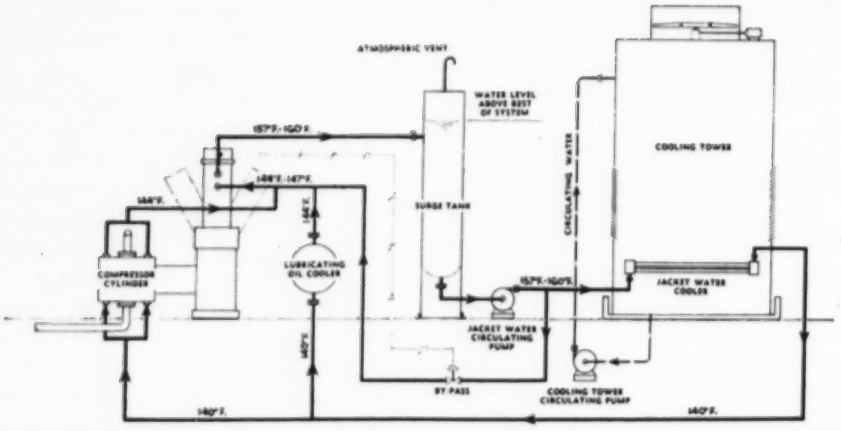


Fig. 5. Jacket water cooling system with the full flow of engine jacket water circulated through the lubricating oil cooler.

of increasing importance, until today, when closed cooling water systems are the rule. Our discussion considers this type of system.

The jacket water system is divided into the following cooling areas:

1. Power cylinder jackets, including the exhaust manifold.
2. Compressor cylinder jackets.
3. Engine lubricating oil cooler.

The consensus among engine manufacturers seems to indicate that the average temperature of the cooling water to the power cylinder jackets runs from 145° F to 150° F and from the jackets, about 160° F. A 10 °F rise through the jackets is desirable with a maximum of 15° F rise. The more water circulated with minimum temperature rise, the less stress in the jacket walls and other parts of the engine.

The lube oil enters the engine at a temperature fairly close to that of the cooling water to the power cylinder jackets. For this reason the water to the oil cooler is somewhat colder than the water to the engine jackets. The difference in temperature of the water entering these two areas is more or less dependent on the size of the lube oil cooler and the quantity of water circulated through it.

Cooling water temperature

The temperature of cooling water to the compressor cylinder jackets is usually close to that of the water entering the lube oil cooler.

Cooling water temperatures to the compressor cylinder jackets and the lubricating oil coolers vary considerably. Where the temperature of the water to these units is somewhere between 100° F and 130° F and the lube oil coolers are of average size, two jacket water streams are frequently used. This arrangement includes one stream of water serving the lube oil cooler and compressor cylinder jackets in parallel with each other. Another stream of water is then circulated through the engine power cylinder jackets at an influent temperature of between 145° F and 150° F. An alternative to this arrangement—still considering the same size oil cooler—is to circulate a single cooling water stream through all three cooling areas. In this latter case the water is circulated in parallel through the oil cooler and compressor cylinders, after which the total flow is recirculated through the engine power cylinder jackets and the temperature automatically controlled at the desired point. Of the two cooling arrangements described above, the former, employing two separate water streams, affords more positive temperature control (see *Fig. 4*).

Another jacket water flow arrangement may be developed where higher compressor jacket water temperatures and larger lubricating oil coolers are used. This requires a shell-and-tube type cooler of sufficient size to circulate the full flow of jacket water needed by the engine power cylinders. In this case the jacket water is circulated in series through the lube oil cooler and engine jackets in the order named. Cooling water from the same stream is circulated through the compressor jackets in parallel. This arrangement is illustrated by *Fig. 5*.

A number of variations to the above systems are used. In some instances gas compression ratios are low, or, say, less than 2-to-1. In such a case, circulating water through the compressor cylinder jackets is replaced by filling the jackets with oil or by the use of air-cooled cylinders. The comparatively small amount of heat induced is dissipated through radiation.

The jacket water system should be arranged so that the least amount of water pressure is exerted against the cylinder head gaskets. This is accomplished by discharging the water directly from the jackets into a surge tank and then pumping through the water coolers to the lube oil cooler and back through the jackets. The surge tank should be vented to the atmosphere and carry the cooling water level above the rest of the system. The circulating pump should be located close to the surge tank with a large suction line, free from bends, thus reducing the possibility of cavitation to a minimum.

Starting air

Starting air at 250 psig is believed to constitute one of the operating hazards. This belief assumes that the lubricating oil, which is generally present in the air stream, is subject under some conditions to ignition from the heat of compression. The history of explosions in starting air systems of this pressure is sufficiently convincing to warrant extensive research and protective measures. One means that has been considered logical in reducing this hazard is to circulate the air stream through a shell-and-tube-type cooler on its way to the reservoir. A large proportion of the oil and water present may be knocked out in such a cooler, thus reducing the hazard from explosion as well as reducing operational troubles encountered as a result of water. Excessive water present in the air stream often makes starting difficult.

A check valve should be installed in the air line adjacent to the point at which it enters the power cylinder. This installation is a basic requirement, since it constitutes a safeguard against flame entering the starting air line and igniting any oil that may be present. Sufficient storage capacity and adequately sized lines are very important requirements to be considered while planning the starting air system. L. F. Scheel[2] covers the air volume requirements in a paper entitled "Development of Gas Engine Compressor Plants."

Exhaust system

At times, the exhaust line from the engine through the muffler presents a hazard in the form of exhausted fuel gas which has not been ignited. During

a shutdown period leaky valves may allow fuel gas to collect in the exhaust line. False starts may also produce the same effect.

When the engine is started this gas is ignited, causing an explosion. Heavily constructed mufflers installed in a vertical position have a tendency to help purge the system of pocketed gas and offer resistance to minor explosions. A more positive means of purging this system of gas pockets is to install an air jet in the line close to where it leaves the engine. This arrangement allows the operator to blow out the exhaust system just before starting the engine.

Apart from the hazards described above, it is possible to utilize the exhaust stream for useful work in the improvement of operating conditions. This is accomplished by the installation of air-cooled mufflers, which draw the heated air away from around the engine area.

Safety considerations

At least one state safety code requires that blinds be located in gas lines to and from compressor cylinders in cases where there is any question concerning the tightness of the block valves. The conservative decision usually includes blinds for the protection of anyone working in or around the compressor cylinder. The same provision applies to gas scrubbers or similar units of equipment.

Shutoff valves should be located in the main gas inlet and outlet lines at a safe distance from the engine-compressor units, preferably at the plant boundary. The conventinal method of shutoff is by air-actuated remote control from a central station located at a safe and convenient point. Some of the safety codes require that these shutoff valves be located at a "safe distance" from the plant or major equipment; 300 ft seems to be the typical "safe distance."

High liquid level alarms should be placed on all gas scrubbers to protect the compressors from liquid "carry-over." These alarms are usually float-operated and connected to an electric relay for actuating an alarm or shutting down the compressor units.

The following are some of the installations made as precautionary measures to safeguard personnel against lethal gases in the compressor system:

1. Air blower and necessary duct work located in the compressor house. This produces a positive circulation of air throughout the length of the building sufficient to sweep any accumulation of gases out of the building through the pipe trenches.

2. Double block valves and bleeders in gas lines to and from compressor cylinders. The bleeder is placed between the block valves.

3. Air-ejector type evacuators at each machine taking suction from the distance piece between the crankcase and compressor cylinder for the purpose of creating negative pressure around the piston rod packing.

4. Gas analyzer with connections at each compressor cylinder and all other critical points.

The problems discussed do not by any means cover all the difficulties encountered in the average compressor plant. However, if they are given due consideration, it is believed that much may be accomplished toward planning a satisfactorily operating plant. ■

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Construction time cut with precast concrete beams

Precast grade beams saved two weeks of time each on two buildings under construction for Manufacturers Light & Heat Co. The panel is being positioned by a crane.

PRECAST concrete grade beams saved two weeks construction time per building on a 54-ft by 40-ft compressor station and a 54-ft by 30-ft auxiliary structure built recently for Manufacturers Light & Heat Co. at Adaline, W. Va.

E. S. Wright, manager of construction for Chemical Plants division of Blaw-Knox Co., Pittsburgh, cited these specific advantages for the precast method: (1) Construction progress is more continuous; (2) form building is minimized; (3) excavation is limited; (4) ground level work goes faster; (5) stronger beams are produced.

To produce grade beams, a casting deck is set up. Comparatively simple side forms, requiring a minimum amount of lumber and labor, were placed. The deck formed one side of the cast and the opposite side was troweled to the proper width and finish. Thus, stripping of forms was reduced to removing edge panels.

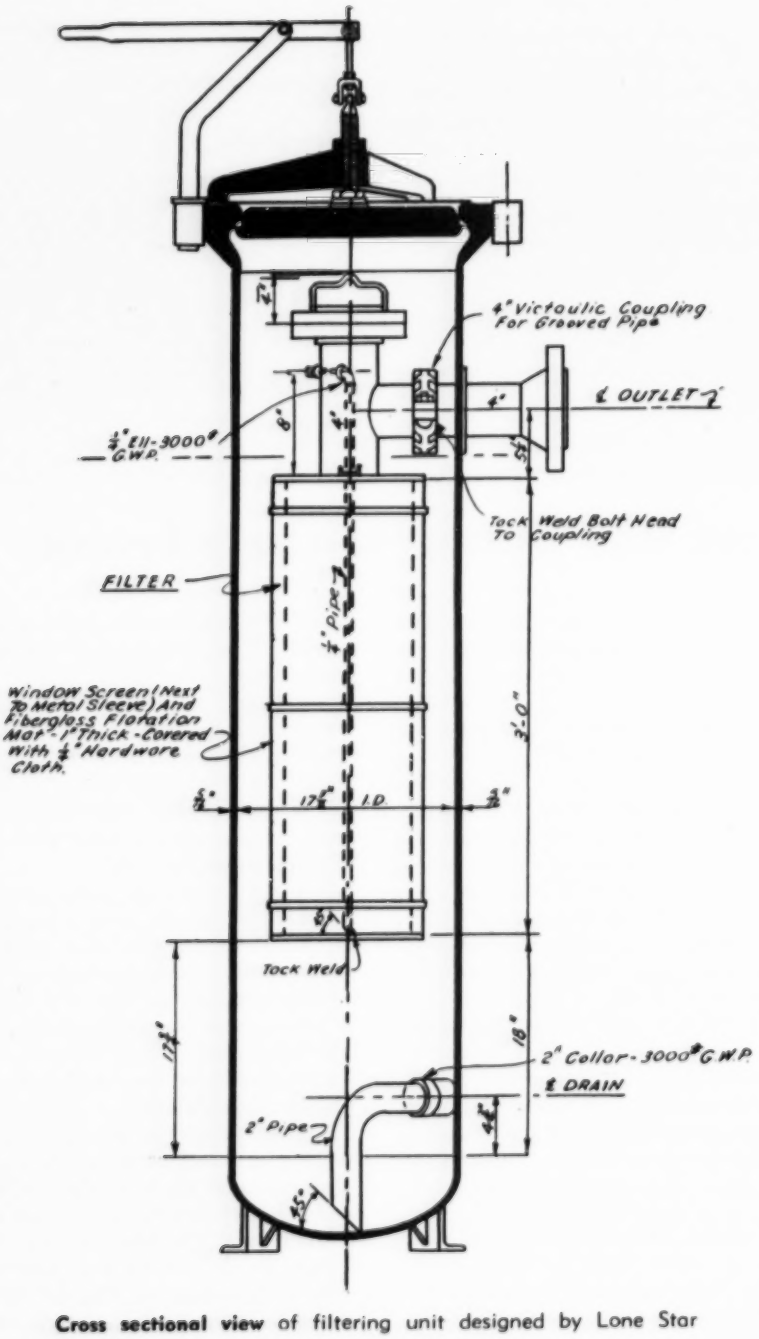
Only two different forms were used to cast all grade beams for the Adaline plant. The form for the compressor building is 6 ft 9 in. wide by 18 ft long by 9 in. deep. The auxiliary station panels were cast 2 ft 9 in. wide by 18 ft long by 9 in. deep.

After forms are in place, reinforcing rod is set. If there are to be any wall openings in the grade beams, a form of proper size can be set on the casting deck and secured in place. The beams were set up in one day and were ready for stripping on the third.

Lifting lugs were cast with beams to facilitate placement by crane. These were cut off after the panels were in place. After placement, reinforcement rods extending from the panel ends were welded to adjacent pier reinforcements. By placing forms on each side of the junction, a simple pour made the foundation continuous and unbroken.

The precast method, already tested on larger jobs, should prove equally advantageous in other small building construction projects calling for time savings and cost economies. The same techniques will be used for construction of a similar station at Downingtown, Pa., for Manufacturers Light.

Filter unit screens minute particles from natural gas


4" Victoulic Coupling For Grooved Pipe
4" OUTLET
4" ELL-3000# GWP
Tack Weld Bolt Head To Coupling
FILTER
4" Pipe
Window Screen (Next To Metal Sleeve) And Fiberglass Flotation Mat - 1" Thick - Covered With 4 Mesh Hardware Cloth.
3'-0"
17½" I.D.
Tack Weld
2" Collar - 3000# G.W.P.
2" DRAIN
2" Pipe

Cross sectional view of filtering unit designed by Lone Star Gas Co.

Lone Star engineers have built a filter unit that removes all solids and agglomerates liquids in the gas stream.

SCREENING minute particles from natural gas at critical points on transmission and distribution lines is the job of a filter unit constructed and put into use by Lone Star Gas Co. The unit will filter particles as small as 5 to 10 microns.*

The device consists of a shell constructed of 20-in. pipe, 8½ ft long, which is placed vertically on the inlet side of the gas supply line. Within this vessel a removable cartridge or filter is inserted. Cartridges can be replaced, although the vessel itself remains as a permanent installation.

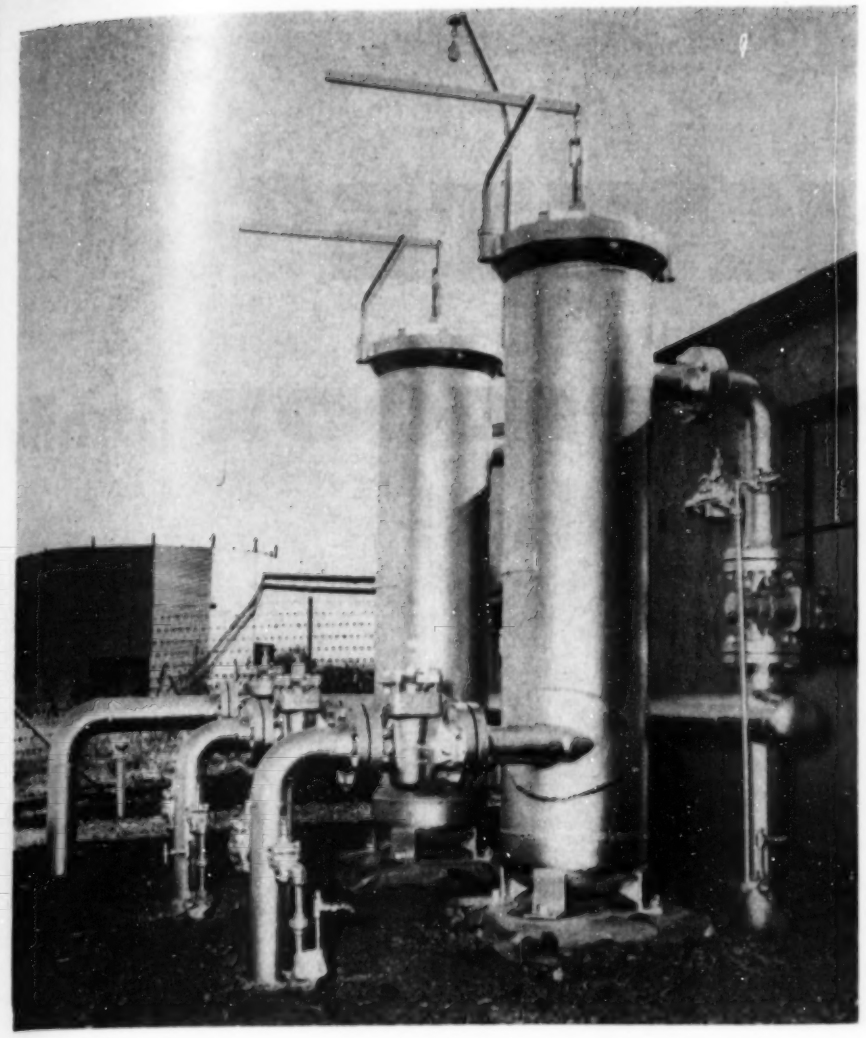
The original cartridge design consists of two thicknesses of fiber glass or flotation matting, each 2 in. thick, and a cartridge frame, which slides vertically into the upright shell along a specially welded track or jamb.

Welding

Since the cartridge must withstand only 10 psi maximum differential pressure, heavy welding is not required in the construction, a factor that minimizes warpage of the unit.

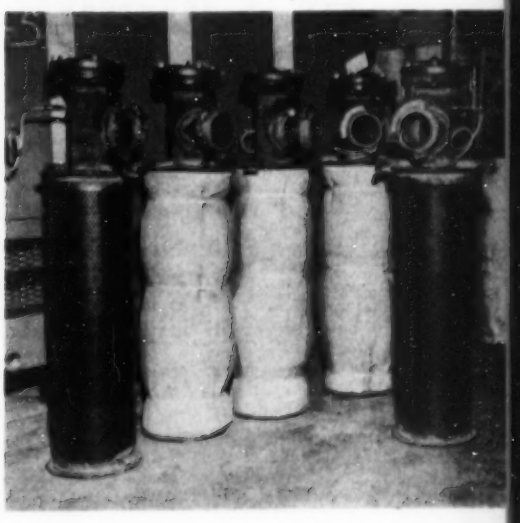
Frame of the filter cartridge is of 10-gauge flat steel bent to shape with additional reinforcing angle welds. The cartridge is approximately 6 ft long. It has a neoprene sponge gasket cemented to the frame, sealing against the jamb to prevent leakage. One-quarter-inch hard-

*A micron is described as one 10/1000 of one centimeter.



Typical filter installation (left).

Filter cartridge (below), showing interior perforated metal support, and fiber glass matting in place.



ware cloth is applied to the facing over the strap iron grid.

The containing vessel has a 20-in. slip-on flange at the top with a blind flange closure lifting lug and davit. It also has a safety head through which gas will pass if the filter becomes clogged and excessive pressures build up within the vessel.

Vessels are installed on a concrete base with ¼-in. steel supports bolted into the concrete.

Lone Star's first filter unit was installed (in February 1953) ahead of the burners at the Abilene power plant where natural gas had been passing approximately a quart of oil daily into the burners. Two units were installed at the Paint Creek power plant in Haskell county the following September.

When complaints from the Texas A&M college power plant indicated a showing of salt water in the nearby Millican field gas supply, a filter unit was installed, upstream ahead of the burners. Another unit was installed at the College Station measuring station for the same reason. Both installations have been doing a satisfactory job of filtering the salt content.

Lone Star's compressor station in the New York City field storage project is equipped with a filter unit to protect the compressor cylinders from dirt and dust brought in the storage gas. Two similar installations are being used successfully at San Angelo power plant and four are installed at River Crest power plant in Red River county.

Dual units

At both Fort Worth and Greenville, dual units are being used, and the company is contemplating installation of a unit at the West Scurry county dehydration plant to filter out glycol, which carries over from a glycol contactor.

The filter will remove all solids but is not completely successful on liquids. However, the filter does remove the fine mist and agglomerate the liquid, which collects on the mat and drops into a liquid storage chamber in the bottom of the vessel. The filter therefore removes salt crystals but not salt water as such; this also applies to oil. In some instances, Lone Star has installed a mist extractor downstream from the filter installation. ■

Adapted from the *Blue Blaze*, published by Lone Star Gas Co., Dallas.

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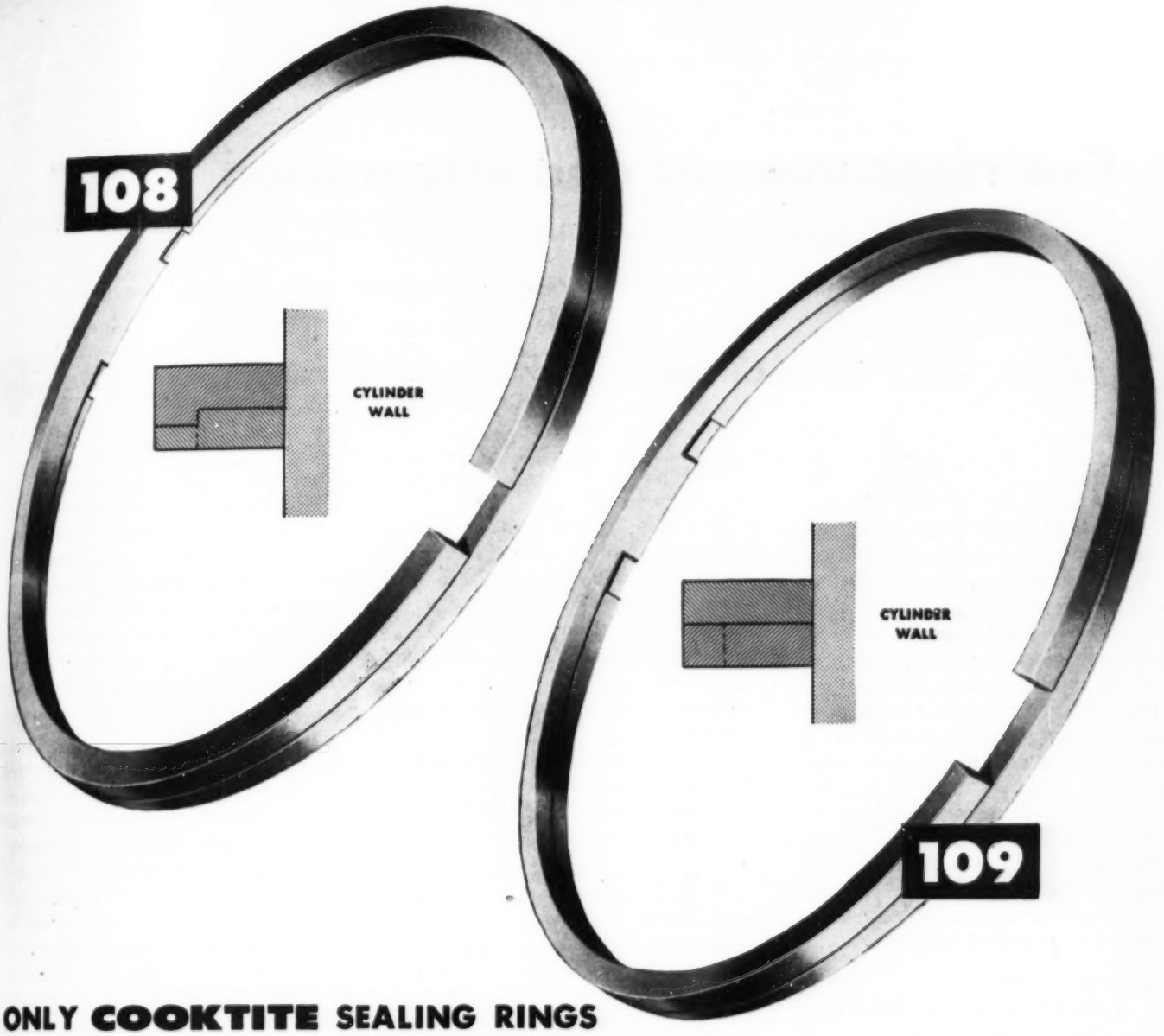

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(wherein the author diagnoses some common complaints)

By J. L. COTTRELL • Flow Measurement Co., Tulsa

Chart does not bear proper notations:

All charts should be filled out properly for location, plate size, line size, date, notations regarding pens not inking, clock running slow or stopped, chart hub not tightened; chart twisted because of moisture on the chart, ice on the orifice or manifold piping, dirt found in the meter run or orifice plate; also proper notations such as "meter out of service while testing," "orifice plate change," etc. The people in the office who read the charts are governed entirely by the notation covering circumstances that exist in the field, and if the operator can estimate the pressure and differential of what the normal reading should be, it will be helpful.

Pitted orifice plate:

A pitted orifice plate on which there are nicks or cuttings on the upstream edge will disturb the flow and cause error in measurement. We must be governed by the AGA* recommendations that the upstream edge must be sharp and the surface of the plate smooth and not buckled.

Orifice not bored or beveled to AGA specifications:

The rule is that the thickness of the orifice plate at the orifice edge shall not exceed:

1. 1/30 of the pipe diameter D_1
2. 1/8 of the orifice diameter D_2
3. 1/4 of the dam height $\frac{D_1 - D_2}{2}$

The minimum of these requirements govern in all cases. It is recommended that, wherever practicable, the requirement (1) be reduced to 1/50 of the pipe diameter D_1.

In some cases, the thickness of the orifice plate will be greater than permitted by these limitations, and in such cases the downstream edge shall be cut away (or beveled) at an angle of 45° or less to the face of the plate. All orifice plates that are beveled should have the square edge side (i.e., the side opposite the beveling) stamped *"Inlet."*

It is recommended that for the commercial measurement of gases, the orifice pipe diameter ratio (D_2/D_1) be limited as follows:

(a) With meters using "flange taps," D_2/D_1 shall be between 0.15 and 0.70 in.

(b) With meters using "pipe taps," D_2/D_1 shall be between 0.20 and 0.67.

All orifice plates should be stamped *"Inlet"* and *"Outlet"* so that when the plate is beveled on the downstream side, it will minimize the possibility of reversing the plate. A beveled plate upstream will cause approximately 14% low measurement.

Sampling connections or other obstructions are improperly placed in meter run:

We suggest reference be made to the AGA table on Meter Runs, which shows effect of ells, valves, fittings, etc. Usually a safe practice would be to have no fittings on the meter run less than 10 pipe diameters upstream and, say, five pipe diameters downstream.

It is recommended that thermometer wells be put on the downstream side of the orifice. However, if used on the upstream side with straightening vanes, they should be ahead of the straightening vanes in all cases. Where there is a manifold of several orifice meter runs, it is desirable to place a thermometer well on each run, at least for checking purposes, so that the recording thermometer, which might be located on a common header, can be checked. Temperature should be the same, providing there is no drop in pressure from the thermometer well on each run as compared to the one located on the header.

Where pipe connections are used, measurement should be taken from the face of the flange, 2½ pipe diameters upstream and 8 pipe diameters downstream. I recall several years ago seeing a meter installation which had been designed in accordance with the rule that no restrictions or connections should be made less than 10 pipe diameters on either side of the orifice. The pipe connections to the gauge had been carefully made at 10 pipe diameters on each side of the flange, then flange coefficients were used. Obviously, the injection gas could not be balanced. This made an error of some 32%. We *can* get on the wrong page in the book.

Dirt or other accumulation in the meter run:

Drips or scrubbers are recommended to keep dirt out of the meter run, as we base the coefficients on a given internal diameter of pipe and if it is partially filled up with dirt, an erroneous reading will result. Dirt that builds up on the face of the orifice, forming a cone or throat but not decreasing the orifice diameter, will give a low reading. But if the dirt is accumulating on the periphery of the orifice, decreasing its diameter, the reading will be high. Where straightening vanes are used, it is equally important to check the meter run for

*American Gas Association Gas Measurement Committee Report No. 2 (shortly to be revised and available as Report No. 3).

Adapted from a paper presented recently before the Arkansas-Louisiana-Texas Measurement Society.

dirt. If these tubes should be filled with dirt, rocks, or shipping tags, the straightening vanes would defeat their purpose as most of the flow would be channeled through a few of the tubes; the effect would be a condition similar to having an additional orifice ahead of the measuring orifice plate.

What is the effect on accuracy of measurement where differential pen recording is restricted by pulsation choke or dampening valve between high and low pressure side of meter?

Manufacturers have equipped their meters with pulsation dampeners that retard the flow of mercury from the high side to the low side of the meter; therefore, with a chart on which the differential pen was pulsating 10 in. on a 100-in. chart, by dampening the meter the width of this band could be decreased to possibly 2 to 4 in. This type of dampening is sometimes necessary in order to keep the differential pen "in the ball park," but it is not good practice on large volume meters, for if the differential pen paints a solid stripe, it is difficult in interpreting the chart to know whether most of the pulsation was on the bottom or the top side of the line. The usual practice in integrating a chart of this kind is to take one-third up from the bottom edge, to half way or the center of the recorded line on the chart. This will vary, however, depending on the type of pulsation, and if enough money is involved, a 15-minute or 1-hour clock should be installed to determine more closely the characteristic of flow. It is much better to use some kind of snubbers to take the pulsation out of the flowing stream than to dampen the meter. By dampening, the sensitivity is decreased, and the chances are the meter will be reading too high at low differentials. Fountain pens are recommended for the differential pen where meters are measuring widely fluctuating flow. They are a necessity on 7-day and 8-day charts.

What is the effect of measuring liquids due to slight oxidation of mercury or carbon deposits?

Any accumulation that will cause the mercury to emulsify will cause the meter to be sluggish and any material that accumulates in the manometer assembly and displaces mercury will increase the mercury level slightly, thereby causing error. Seal pots should be used in those cases where a corrosive liquid might emulsify the mercury. Seal pots should be designed for enough capacity so that the sealing liquid will not vary more than ¼ in. (linear inch) for full range of the meter.

What is the effect of stuffing box leakage on accuracy of differential shaft?

Any leakage around the stuffing box will tend to blow the lubricant out if it is the lubricated type. The higher the pressure on the meter, the more likely are leaks to atmosphere to cause hydrate formation and freeze the stuffing box shaft. Most manufacturers are now using a teflon bearing, reducing the need for lubricant and minimizing leaks at this point. If the leak in the stuffing box is severe enough it will have the same effect as a leak on the downstream side of the meter.

There is a new "non-freeze" differential bearing on the market that does not use teflon but is mounted in ball bearings, and the seal is on the end of the stuffing box that connects to the vessel rather than on the end that is exposed to atmosphere. This eliminates dirt and hydrate accumulation in the pressure bearing assembly. These bearings are available for various makes of orifice meters.

Meter or manifold leaking on downstream side of the meter, or upstream side:

If the meter is leaking on the downstream side, the differential pen will read high. If leaking on the upstream side, the meter will record low.

Improper size orifice, causing low range or overrange on chart:

Good practice would be, for example, on a 100-in. chart, to size the orifice so the differential would never be below 10-in. minimum range and 80-in. maximum range. There are two reasons why extremely low differentials are not recommended. One is that the closer the flow pen goes toward zero the greater the capacity of the meter, which means that the slightest error in calculating the chart would be magnified. Secondly, particularly on field meters, if there should be any dirt in the mercury, or the meter be dampened, there would be less power in the float as the meter approaches the zero line. However, where wide fluctuation of flow is encountered, it is better to keep the reading on the chart than to estimate the flow if the pen should be overranged. Where frequent overranging is encountered, two meter runs should be used. One run should have a controller type "off-and-on" meter that will actuate a throw-over valve or regulator so that the one run can be opened; the two meter runs can be used to handle maximum rates of flow with the one meter run handling the minimum rates of flow when the throw-over valve or regulator is closed. There is obviously a limit to the spread that can be measured with one meter run and orifice plate.

What is the effect of charts on measurement?

All manufacturers are making more accurate charts and, in some cases, are using master plates to print the charts and punch the ½-in. center hole at the same time. Seven-point charts are affected less by humidity than 5-point charts. When chart shipments are received, the old stock should be used as soon as possible; if a few boxes of charts are allowed to remain on the bottom of the stock for several years, they will be distorted and cause inaccurate measurement. Care should be taken in removing the chart from the meter—the center hole should not be torn, for if the chart is read on a planimeter or integrator, there will be no way to center it. Charts should *not* be folded. Boxes or containers should be used to prevent the postal department from disturbing them in transit.

What clock rotations are desirable?

Many companies use 24-hour, 7-day or 8-day rotation. If the pressure and differential lines do not vary over 10%, the situation will be ideal for 7-day or 8-day charts. If, however, there is extreme fluctuation, a 24-hour chart is more desirable. Some 48-hour and 72-hour charts are used, depending on working conditions. This is a problem for each company to work out for itself, depending on the volume of gas being measured, price and cost of changing the charts. Remember that a 7-day chart has one-seventh of the recorded area of a 24-hour chart, and where intermittent flows are measured, the differential lines should be far enough apart so it can be read by observation or properly traced with the integrator.

What effect do hydrates have on gas measurement?

Many transmission companies will not purchase gas until it has gone through a dehydration plant. Many companies are using individual well dehydration units or at least for a group of wells, and where it is dehydrated before the gas is measured, many of the problems will be eliminated. ■

At 7th annual convention

Contractors study U. S. and Canadian outlook, new pipelining methods

Back row (l to r): Canadian Pipe Line Contractors Association officers: R. K. Banister, 2nd vice president; A. O. Ackroyd, executive secretary; E. W. Costello, president; C. A. Callanan, director; G. A. Wilkinson, 1st vice president. Front row: Pipeline Contractors Association officers: John H. Williams, treasurer; C. C. Bledsoe, 1st vice president; H. C. Price, president; Earl Allen, 2nd vice president; Richard A. Gump, executive secretary.

THE seventh annual convention of the Pipeline Contractors' Association had a distinctly Canadian theme during its successful meeting held in Los Angeles from Jan. 17-19. More than 35 Canadians accepted the invitation to meet with the membership of the association to discuss the problems and outlook for domestic and Canadian pipeline ventures. Undoubtedly the Canadian natural gas developments of the past several years had a major part in the discussions that were prevalent at the Los Angeles' Hotel Statler.

G. Austin Manuel, president of the Pipeline Contractors Association during 1954, set an optimistic pattern in his welcoming address by predicting that 1955 will be one of the best pipeline years that the contractors have experienced. There will be more than 14,000 miles of cross-country lines constructed during the coming year; this compares with a similar figure of 11,000 miles for 1954, but does not necessarily mean that all of the 71 big-inch (over 20 in. in diameter) spreads available will enjoy 100% utilization. Actually, Mr. Manuel pointed out that approximately 17 of these spreads were idle during the past year; however, the increased over-all mileage construction figure may mean that more of the $100 million worth of equipment owned by the members will be kept busy in '55.

The boom in the Canadian oil and natural gas activity urged the investigation of pipelining conditions, both legal and physical, in that neighborly land. It was evident that many of the contractors anticipate Canadian operations in the not too distant future. Some of the legal factors pipeliners will encounter in Canada were brought out in an address by R. A. MacKimmie of Calgary, Alta., who spoke on "Canadian Laws and Regulations Affecting Pipeline Contractors." Mr. MacKimmie has participated actively in all the major gas export hearings held in Alberta and acted as council for Trans-Canada Pipelines Ltd. He pointed out that "the Canadian people, their institutions and governments, while differing from their American neighbors in innumerable details, are basically the same. The way of life, things that develop national character, are almost identical. Naturally this results in the methods of doing business being virtually the same."

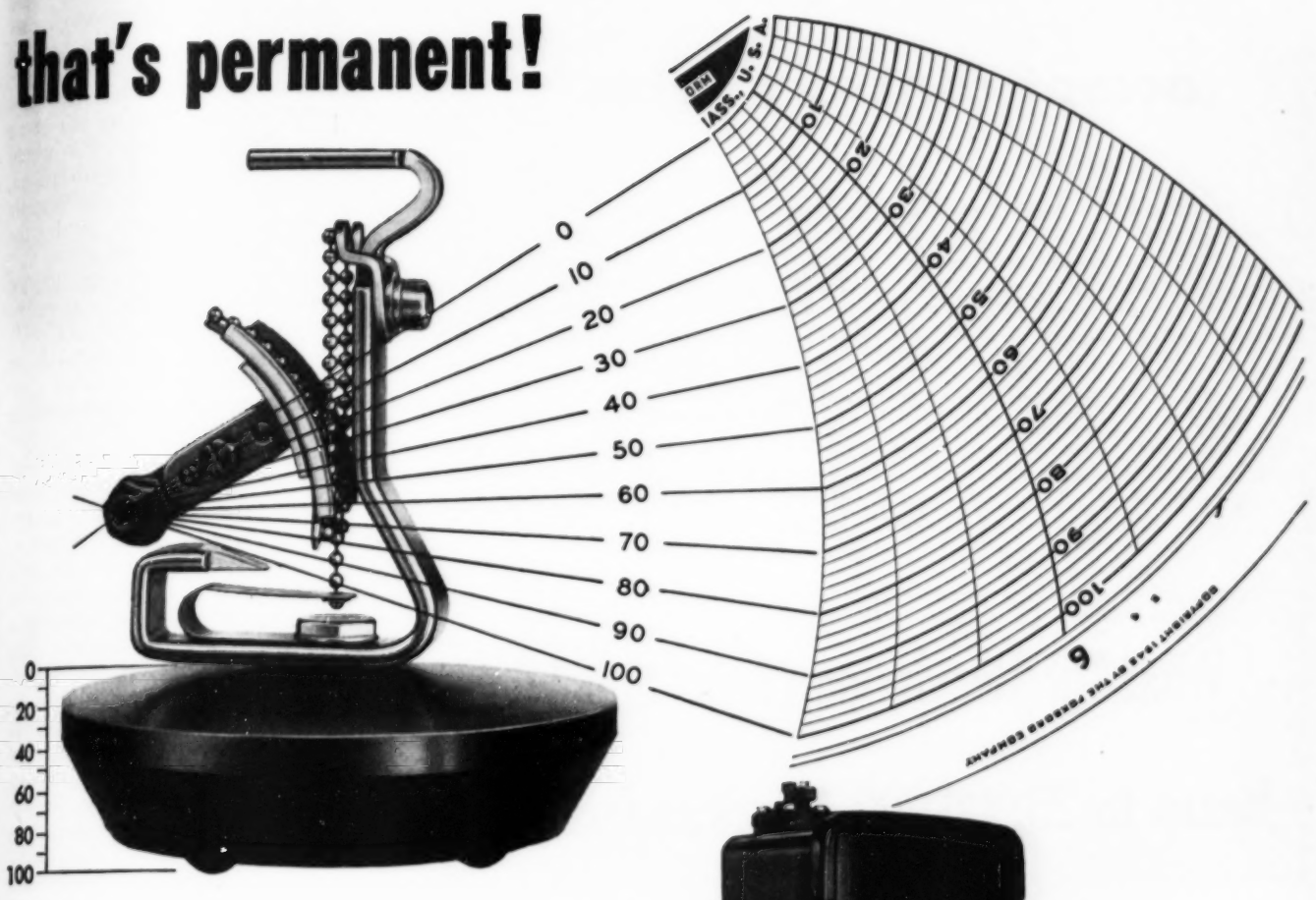
"Outlook for Pipelining in Canada" was the subject of a well received talk by N. E. Tanner, also of Calgary, and president of Trans-Canada Pipe Lines Ltd. Mr. Tanner spoke briefly on transporation's place in progress and tied in the development of oil, gas and other transportation facilities with the great progress in Canada's economical growth. He reported that Trans-Canada expects to complete that portion of its natural gas transmission line from the Alberta border to Winnipeg and on to Emerson by the fall of 1955. This will involve 574 miles of 34-in. line to Winnipeg, and 42 miles of 24-in. line to Emerson. "There will be an abundance of gas and an ever-increasing market, the combination of which will provide opportunities for those engaged in the pipeline industry," Mr. Tanner said.

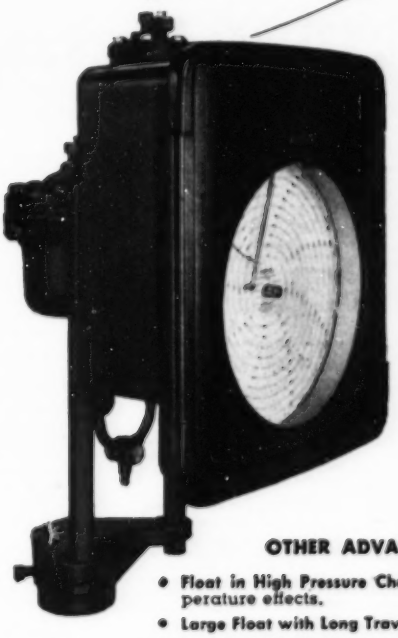
The contractors and their suppliers in attendance were deeply interested in the development of larger diameter pipelines and the problems in design, construction, and construction equipment that they present. Raymond H. Crowe, chief engineer, Transcontinental Gas Pipe Line Corp., Houston, and John Gay, Associated Pipe Line Contractors, Houston, detailed some of the construction methods used during Transco's program of looping with 36-in. diameter pipe. (See *GAS*, December 1954, p. 96.) The sewer pipe method was employed; this, and the whole operation, were demonstrated by use of a color movie showing the actual construction. Mr. Crowe explained that the cost of constructing 36-in. lines runs about 1.25 to 1.30 times the cost of 30-in., but the increased capacity produced warrants use of the larger pipe. It was brought out that there is an urgent need for heavier construction equipment so that contractors can more efficiently meet progress demands when constructing these super-inch lines. In view of the success of the B-36 operations, and in light of the increased demand for natural gas in Transco's market areas, the company plans to loop its system with 36-in. diameter pipe from Louisiana to the Piedmont area, and with 30-in. pipe from there to Philadelphia and New York. They expect to start construction on 330 miles of the 36-in. loops very shortly on approval by the FPC.

Approximately 550 regular, special, and associate members registered for the convention.

Officers elected for 1955 are H. C. Price, H. C. Price Co., Bartlesville, president; C. C. Bledsoe, Midwestern Constructors Inc., Tulsa, 1st vice president; Earl Allen, Associated Pipe Line Contractors Inc., Houston, 2nd vice president; John H. Williams, Williams Brothers Co., Tulsa, treasurer. Richard A. Gump, Dallas, was reelected executive secretary.

Full-scale meter accuracy that's permanent!





Exclusive Segmental Lever Design Gives Linear Transmission from Float to Pen Point . . . No Angularity Errors

A basic-design feature of Foxboro Flow Meters insures permanent calibration at all readings on the scale, by eliminating angularity errors and lost motion. The exclusive Segmental Lever drive transmits vertical motion of the float to the pen in positive, linear relationship. Its stainless steel ball chain runs free and true, regardless of meter alignment.

This is only one of several better-engineered features that have made Foxboro Flow Meters the unqualified choice of industries wherever dependability and "cash-register" accuracy of metering are important. Available in rectangular and circular case models. Write for complete story in Bulletin 460. The Foxboro Company, 342 Norfolk St., Foxboro, Massachusetts, U.S.A.

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- **Float in High Pressure Chamber** minimizes ambient temperature effects.
- **Large Float with Long Travel** gives high-power pen drive.
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First in FLOW METERS

FACTORIES IN THE UNITED STATES, CANADA, AND ENGLAND

Producers urge FPC to accept contract rates

THE Federal Power Commission, in setting rates for natural gas producers, should accept contracts made at arm's length between producers and pipeline companies as prima facie evidence that the rates covered in such contracts are "just and reasonable."

Such was what appeared to be the only concrete proposal that producers could offer last month, when they accepted the FPC's invitation to attend a hearing purportedly called to seek their advice on the best means of regulating them under the procedures instituted by the commission as the result of the Supreme Court's Phillips case decision.

The suggestion, advanced by David Searls, Houston attorney representing several producing associations, met with something less than hearty accord among commissioners and staffers. FPC General Counsel Willard Gatchell said it would be a "serious departure" from methods traditionally utilized to protect the public. Chairman Kuykendall questioned both the economic and the legal aspects of such a procedure.

The hearings, which brought to light a number of conflicting opinions as to the proper regulatory procedure, were only one of several new developments in the total picture. Another was the readying of a bill to free the producers, which was expected to be introduced into the Congress before the end of the session's first month. Just who would introduce the bill was not established, although Rep. Frank Ikard of Wichita Falls, Texas, was quoted as "putting the finishing touches" on such a bill.

A "General Gas Committee," headed by Maston Nixon, president of Southern Minerals Corp. of Corpus Christi, was handling the direct lobbying duties for producers in an effort to get Congressional approval of the forthcoming bill.

Another committee, avowedly unrelated to the General Gas Committee, was firing the opening guns in a campaign to lobby the natural gas consumers of the nation into actively supporting whatever measures are proposed in Congress to free the independent producer from the Natural Gas Act regulation. A $1.5 million kitty was available for use in spreading ads across the nation's newspapers, as well as running the necessary machinery to plant feature stories and editorials, and develop special programs for enlisting the support of service clubs and civic groups.

And down in Austin, the always-vocal Texas Independent Producers & Royalty Owners Association was pressing the state legislature to pass an "economic waste" statute to force fair, competitive field prices. Substituting state regulation for the present pipeline company proration, the statute would empower the state railroad commission to shut in all production in a given field until wellhead prices of all producers and royalty owners are adjusted to a point that would eliminate discrimination, according to President Jack Woodward of TIPRO.

In general, the Washington hearings appeared to establish the relative positions of so-called "consumer groups," distributing utilities, pipeline companies, and producers, although there was considerable variance among the stands taken by units within each group. The public utilities commissions, purportedly representing the consumer, favored a rate base method of regulation; but here the Illinois commission split off in favor of a commodity value concept. Eastern utility companies appeared to favor regulation, but on the whole were stumping for commodity value base.

The Searls proposal was predicated on the principle that the courts have always held that FPC is free to work out formulae in determining "just and

What the Regulation of Gas Supply Means to 25,000,000 American Families

THE FIVE THOUSAND producers of natural gas—large and small—believe that the free competitive system which has increased your gas supplies and kept rates low is the best for consumers, for the industry, and the economy.

They believe the proposal to abandon competition and clamp bureaucratic controls on gas production will hurt consumers, damage the industry, and benefit no one.

Here are some answers to questions you as a consumer may have on this vital issue.

What Is This Regulation?

Sixteen years after a 1938 law was passed, a new interpretation of some of its words now forces the Federal Power Commission to do what it has eleven times refused to do—try to fix the price that an interstate pipeline pays the 5000 competing producers who find the gas and get it from the ground.

Will This Regulation Reduce Our Gas Bills?

Hardly. Only about 10% of the average gas bill goes to the producer who finds the gas and sells it. The other 90% pays for constructing, maintaining and operating the long-distance pipelines and local distribution systems—already regulated.

How Will Regulation Affect Supply?

It will reduce the supply. Most natural gas is produced by "wildcatters" and other independents. They are used to keen competition and big risks. But put them under Federal controls—with permits, endless forms, licenses, hearings and suits—and the work of exploration is sure to suffer. Three new pipeline projects to bring gas to more consumers have been suspended since regulation took effect.

Hasn't Gas Always Been Regulated?

Gas distribution, yes. It makes sense to have only one pipeline bring gas to a community—and one gas company distribute it in the community. Both do a good, efficient job for you, and as monopolies they are naturally regulated.

But there's no monopoly in *finding* gas. Far from it. Gas *production* is risky and keenly competitive. There are five thousand large and small producers looking for gas—and finding it is only one out of every nine exploratory wells they drill. They compete vigorously to sell their gas. A single pipeline may buy from 200 or more producers.

Is Gas Different from Coal or Oil —or Grain?

It isn't. And if there's price-fixing for natural gas at the well no one there be sure for coal at the mine or oil at the well—or lumber in the forest, or grain on the farm.

How Did The Consumer Fare Before This Regulation?

Here's the record. In the past 16 years natural gas production has increased 200%, and the price the consumer paid for gas has risen only 1/11th as much as the general cost of living.

Do Only A Few Big Companies Produce Gas?

No. The largest 37 companies produce less than half the nation's gas. No single company produces more than 5%. The small producers do more exploratory drilling than do all the big companies combined. And none of the producers has any monopoly, any exclusive franchise, or any protection.

What Is The Natural Gas and Oil Resources Committee?

It is made up of companies and individuals concerned with natural gas. It includes a great many large and small gas and oil producers. All believe there is no more reason for OPA-like price-fixing on gas than on steel, coal, autos, meat, or shoes, which could be next. All believe that free competition is better for all of us than a price-controlled economy, which has historically led to stagnation, scarcity and rationing.

What Can I Do?

You can reason out the issue, reach your own conclusions, and make those conclusions known to your friends and neighbors.

Under free competition without federal regulation—

- Natural gas became plentiful—output rose two hundred per cent in the past sixteen years.
- Natural gas stayed reasonable—and gas prices to the consumer rose only one-eleventh as much as living costs in the past sixteen years.
- Natural gas has helped create thousands of jobs in industry and now supplies one-fourth of the nation's energy resources.

NOW..... cumbersome federal controls threaten all this progress.

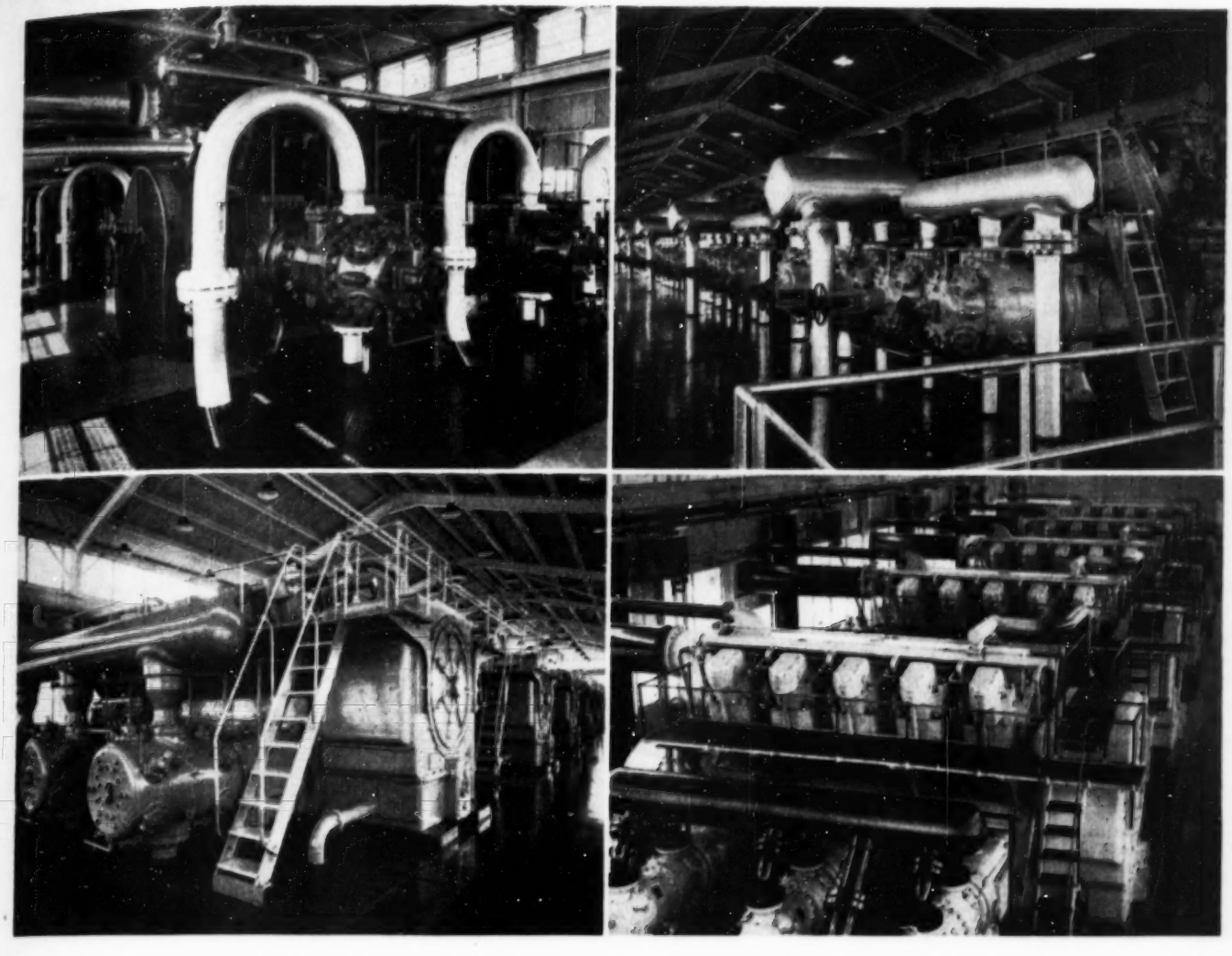
FOR MORE FACTS WRITE FOR THIS BOOKLET NOW!

You have the right to know the facts about this new government regulation—a penniless control of free, competitive producers. Send today for the booklet, "Natural Gas—The Facts About A Key Resource in Jeopardy."

SOUTHERN CALIFORNIA NATURAL GAS AND OIL RESOURCES COMMITTEE

H. W. Bragg, *Chairman* 714 West Olympic Boulevard, Los Angeles 15, California

This is the first ad in the Natural Gas & Oil Resources Committee campaign which began last month to win consumer acceptance of an amendment to the Natural Gas Act. (See story on next page.)



How new gas pipelines can save DOLLARS BY THE MILLIONS

THERE'S been a lot of talk, some very misleading, about the total installed cost of horsepower for gas transmission compressor stations.

Here are some *facts* . . .

Cooper-Bessemer reciprocating engine driven compressors have been installed for $180 per horsepower. This is *complete* cost including *all* auxiliaries. We can find no other type of compressor that has actually been installed at such low cost.

The latest actual cost we can find on a direct fired gas turbine compressor station installation is $247 per horsepower. Let's be conservative and assume a reciprocating compressor station would today cost $225 per horsepower. On a 100,000 horsepower line you would therefore be investing 2 million *extra* dollars . . . on which you would be expected to show a profit.

Now a word about operating expense. Cooper-Bessemer gas engine driven reciprocating or centrifugal compressors are actually showing 25 to 35% *less fuel consumption* than direct fired gas turbines . . . a mighty important saving to any gas pipe line company.

If it's your money going into a new gas pipe line project, or any other heavy-duty power application for that matter, you'll be wise to ask if Cooper-Bessemer engines or compressors are to furnish the power.

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reasonable rates"; competition is the greatest regulator of price, and there is ample competition among producers for pipeline markets; and with the commission accepting contracts as prima facie evidence of "just and reasonable rates," should complaints be filed under Sec. 5(a) of the Natural Gas Act, let the commission hold an investigation; and if this investigation showed that the rates filed reflected real competition, let them stand.

Counsel Gatchell said:

"There has been a frank admission in the arguments here that the questions are not legal but economic, whereas FPC responsibility must be discharged within the law and not solely for economic advantage of one of the groups which you are regulating."

Warning that commission regulation must not be thwarted by the lack of a ready formula for regulating producers, Mr. Gatchell urged that the commission study the rates of large producers as a guide in handling rate cases. From these studies would come an equitable means of protecting both consumer and producer, he said.

One of the more articulate of the utility spokesmen was Randall J. LeBoeuf Jr. of Conolsidated Edison, New York, who declared that the present "chaos" stemmed from the operation of automatic price increase clauses, including favored nation, escalation, and price redetermination provisions. E. F. Russell of Brooklyn Union seconded the argument to throw out such clauses. Mr. Russell recommended that FPC steer clear of "fixed formulas," but rather select principal cases involving major producers, important gas producing fields, and large distribution markets, and "determine appropriate producer rates for existing dedications and maximum prices for new dedications." As a starting point for existing dedications, he suggested FPC accept producer rates in effect June 7, 1954. the date of the Supreme Court decision.

Other utility representatives concurred as to the starting date.

J. D. Mann Jr. of United Gas Improvement, Philadelphia, suggested an area pricing method, whereby price ranges, including a base price and a maximum price, would be set for each area. The base price would relate to the average price paid for pipeline gas during 1952, while the maximum would be close to the average of prices recently contracted for by interstate pipelines.

Mr. LeBoeuf pointed out that distributors have no voice in the making of the producer contracts, so must accept the price which pipelines, from their "sheltered position," are free to pass on to the consumer. In asking a ban on escalation clauses, he declared that producers who object may carry their objections on to Congress; but unless they abandon escalation clauses, consumer resistance will kill any legislation proposed.

A case-by-case investigation beginning with the major producers of interstate gas should constitute the FPC's regulatory program declared William E. Torkelson speaking for the Wisconsin Public Service Commission. That body, one of the leaders in the move to have producers regulated, favors a cost-of-service rate base, such a base to include dry hole costs, delay rentals, exploratory and drilling expenses, bonus payments, maintenance, depreciation and depletion charges, taxes, and general expenses. Small producers supplying less than 1 billion ft per year could file proof of cost or accept the average price paid producers in the same area, he said. Opposing favored nation clauses, Mr. Torkelson recommended "limited" escalation, based on actual costs.

"Special procedures" for casinghead gas and for condensate fields were also recommended.

The ill effects of the present regulatory situation are reflected in the position now being taken by financial houses, M. G. Hansbro, Houston independent, told the commission. Mr. Hansbro related how he had been forced to appeal to seven banks before he found one that would carry his paper to finance gas exploration and production. Mr. Hansbro also decried any system that would place a "premium on inefficiency," whereby "the man with the most dry holes would get the highest prices."

Nine producer associations were represented at the hearings, as were the city of Detroit, Tennessee PUC, Ohio PUC, and commissions of West Virginia, Virginia, the District of Columbia, and Maryland. The last named group submitted a proposal for a "broad scale" investigation of the natural gas industry aimed at stabilizing prices.

Public support sought for Natural Gas Act amendment

THE Natural Gas & Oil Resources Committee, an independent group dedicated to the "lobbying" of the public to enlist support for an amendment to the Natural Gas Act, began firing its first shots last month. Initial salvo was a broad-range blast of newspaper ads aimed at laying out the facts in the present controversy, brought about by the stunning Supreme Court decision in the Phillips case and the subsequent attempts by FPC to bring natural gas producers within its regulatory control.

Newspapers in every natural-gas-using city of 10,000 or more population were scheduled for early insertions in the $1½ million campaign. But this is only one facet of the over-all strategy; feature stories, editorials, radio and TV programs, convention and civic club presentations are also on the agenda.

The life of the program—and of the organization—is to be limited by the passage of the amendment, if and when. It is the committee's aim to so clarify the producers' position that the public will throw the weight of its opinion into the coming Congressional debate on the side of the wellhead supplier.

Formed in the late fall, the committee is headed by L. F. McCollum, Continental Oil Co., with Paul Kayser of El Paso Natural Gas Co. as 1st vice chairman and J. C. McDonnell II of Ohio Oil Co. 2nd vice chairman. Officially it is affiliated with no organization, although in a few scattered areas the manpower, machinery, and facilities of regional associations are being used.

The committee's staff received its briefing in meetings in New York in December, and before the end of January the first advertisements began to break. Operations have been subdivided by areas throughout the nation, on regional, state, and area bases. The local organizations enjoy a certain autonomy for ease of operation.

Although producers predominate in the committee makeup, several other interests are involved. Another pipeliner on the committee is John Merriam of Northern Natural Gas Co. Empire Trust Co. of New York is represented. Gas distributors are not generally active in the campaign, although the California companies are lending the position of the committee their tacit support.

By presstime, the backing of several civic bodies, such as chambers of commerce both state and local, had been obtained. Stockholders were being beseeched to support the cause. Company employees have been urged to spread the word among friends and acquaintances. Committee members have visited metropolitan newspapers to plead their cause. Industry speakers are being drafted for appearances before clubs, associations, radio and TV audiences.

A great deal of the spade work is being done by public relations staffs of member companies, on loan to the committee.

To keep in step with your constantly changing business, your communication system should be examined periodically. In that way, your communications never become outdated — always meet your exact needs at the lowest cost. If you have Bell System service, such studies are a continuing activity.

Bell System communication engineers will also help you take a good, close look at your own communications . . . *at no cost to you!* Their detailed study will help you get the most efficient use of your facilities . . . whether they are long distance, mobile, teletypewriter, or metering and supervisory control.

A growing number of pipelines are taking advantage of Bell System communications in meeting the demands of modern operation.

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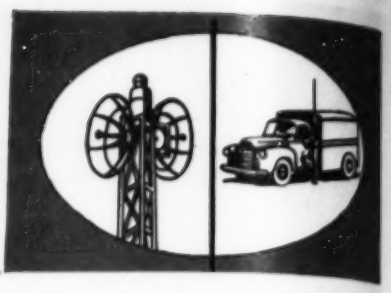

By FRANK CHAPMAN

Survey shows industry use of microwave

THE present usage of microwave radio by private licensees and the prominent place that the gas industry plays in the field is brought out in a report presented recently to the Federal Communications Commission by the Central Committee on Radio Facilities of the API. The report is based on a questionnaire sent to all known and potential users of microwave radio in the petroleum, railroad, forestry and aviation fields. It was presented to the FCC by Dr. W. M. Rust Jr., chairman of the central committee, in answer to a request from the commission.

The report contained information on 24 microwave systems now in operation in the Petroleum Radio Service, plus an additional six currently under construction or contracted for, and 11 systems or major extensions of systems budgeted or under serious consideration. The predominant position that has been taken by the natural gas and petroleum industries in microwave communications is indicated by the fact that all other users reporting—forestry, railroad, and aviation—accounted for a total of only 11 systems currently in operation.

Comparative estimate

The central committeee report made no breakdown between the gas and oil industries that would indicate the usage of microwave radio by those natural gas transmission pipelines that fall within the Petroleum Radio Service. However, a comparative estimate of the microwave usage by the natural gas transmission pipelines licensed in the Petroleum Radio Service may be had by reference to a survey of the gas industry's use of radio communications made last summer by *GAS* magazine and reported upon in the August 1954 issue of the magazine.

In the *GAS* survey questionnaires were returned from 10 of the 20 top natural gas transmission companies. All but one reported microwave systems installed and in operation. Of the 10 not reporting at least three are also known to have microwave systems in operation at the present time. This would appear to indicate that the natural gas transmission companies make up at least half of the total number of microwave systems in use within the Petroleum Radio Service.

Actually a total of 16 companies responding to the *GAS* survey reported on the use of microwave radio. However, six of these were distribution companies (utilities) and not to be classified within the Petroleum Radio Service. Taking the gas industry as a whole, combining the distribution and transmission companies, it was estimated on the basis of the *GAS* survey that some 30 gas companies are currently using microwave radio.

Detailing the microwave systems now in operation by all the four services surveyed (petroleum, forestry, railroad and aviation), the central committee report tabulated a total of 477 stations, 11,417 system miles, and 95,368 channel miles. Referring again for comparative purposes to the communications survey in August *GAS*, the nine gas transmission companies responding to the survey reported a total of 278 stations, 7131 system miles, and 58,718 channel miles in operation. On the basis of these figures it would appear, therefore, that the natural gas transmission companies operate more than 60% of the total microwave facilities in use at the present time by all the major private services.

Additional information on channel usage reported upon by the central committeee indicated 48,985 miles of circuit for station-to-station voice communication; 106 miles for station-to-station telegraphy; 10,649 miles for VHF radio relay or control; 4708 miles for teletype; 9193 miles for remote control; 21,339 miles for telemetry; 278 miles for high frequency radio relay, and 106 miles for selective ringing.

The central committee questionnaire also revealed that there is universal agreement on the part of users of microwave facilities that licensing should specify the radio frequency band width with no requirement limiting the uses to be made of portions of the band width. It also revealed that the consensus is that no authorization should be required for modification of such uses provided the authorized band width is not exceeded.

There is also general agreement that the selection of band should be on the basis of band width required rather than on whether the system is a short-haul or long-haul.

Entrance ledge

Answers to the query concerning entrance into the urban areas indicated that insofar as possible the entrance ledge should be in the same band as the rest of the system. Careful coordination with particular attention to location of the outlying stations will make this possible in most urban areas. Where this is not possible, it is almost certain that wire lines and coaxial cables will be completely infeasible on economic and regulatory grounds, and in such cases, the use of a different band—

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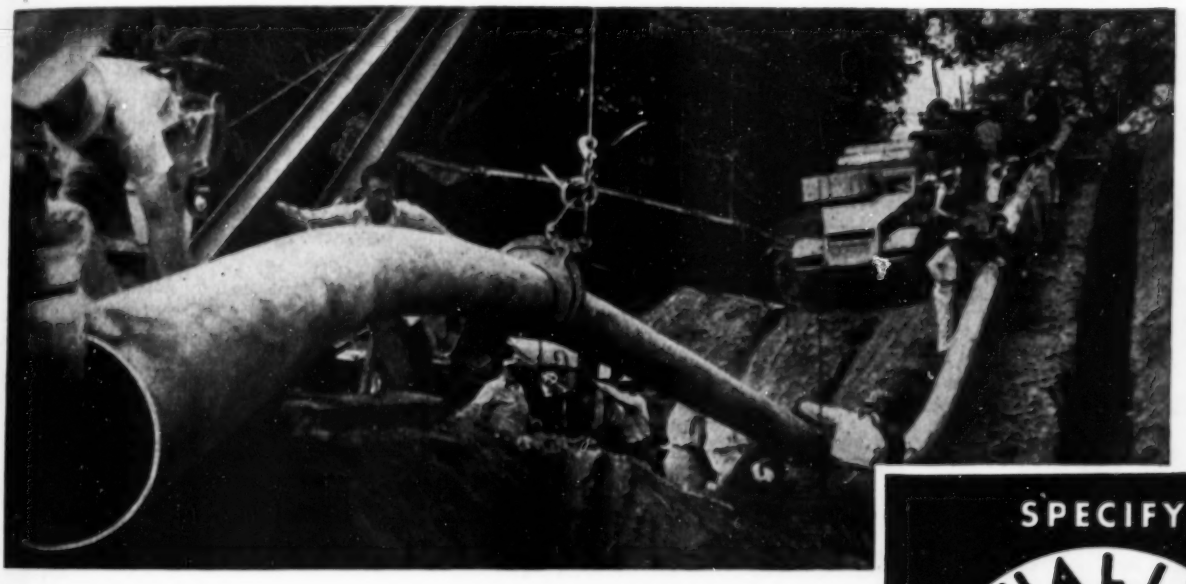

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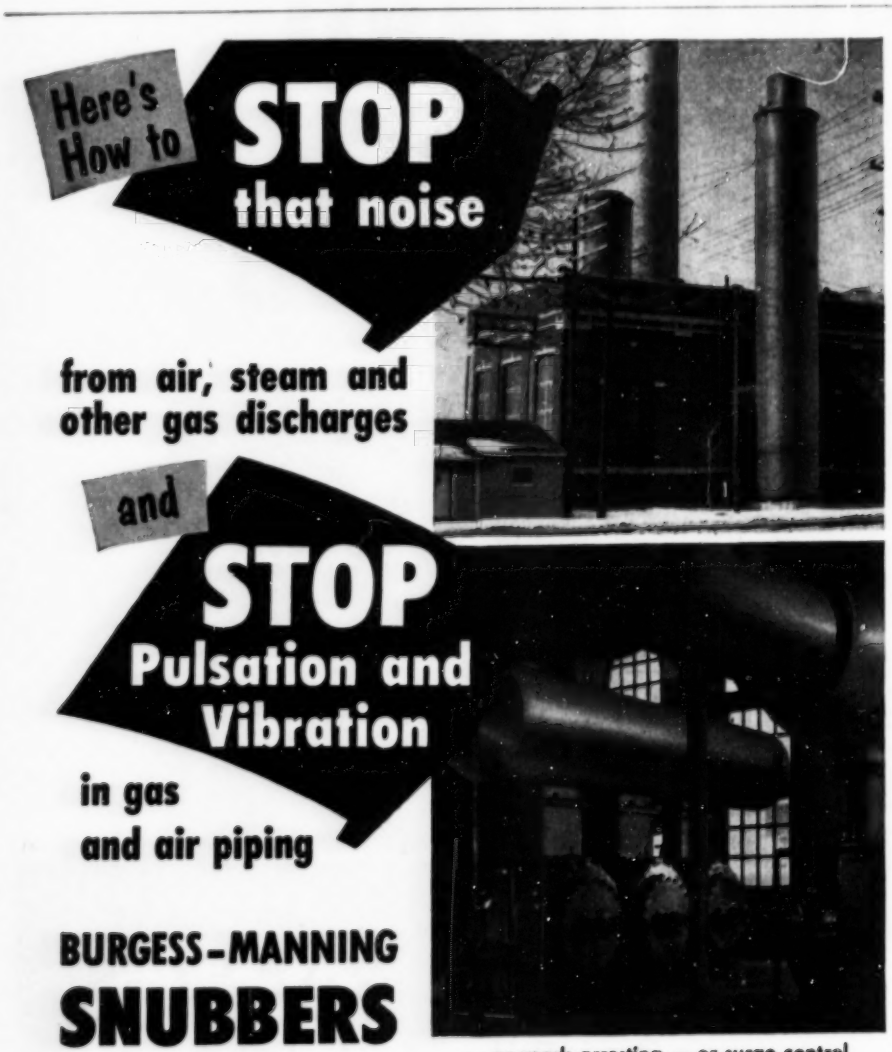
usually higher—for the entrance ledge would be necessary.

In order to reply to the commission's request of analysis of the suitability of each of the available microwave bands of the various operational communication requirements, the users were asked for their opinions concerning the suitability of each of the bands—950, 1850, 2500, 6575, 12,200 and higher—for the types of usage with which they were familiar. The replies indicate that insofar as the users are familiar with these bands, they feel that the four lower bands are each suitable for any of the purposes which they have in mind. The 950 band has some limitations because of the narrow band width permitted. The users are, in general, so well satisfied with the bands in which they now operate that they would not contemplate a change in band if they were to extend their systems. The absence of equipment and experience, if a 12,200 and higher bands, makes the users reluctant to express firm opinions concerning these bands.

The report also recommended that, "... establishment of definite engineering standards and the removal of the developmental status should be accomplished as promptly as possible in order to facilitate orderly growth in the future and to minimize loss to users resulting from forced obsolescence or modification of existing equipment."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New remote control unit for mobile radio

Two-way mobile radio systems can be remotely controlled by a new, small desk unit developed by the mobile communications department of Allen B. Du Mont Laboratories Inc. It permits the operator of a two-way commercial radio system to install a base station at an advantageous location such as a hill-top or the roof of a tall building and control the unit's radio transmission and reception from his desk.

The new remote control unit is designed for use with Du Mont base station equipment. The unit connects to the base station equipment by means of ordinary telephone lines and permits operation under normal conditions over a distance of at least 15-20 miles. It provides facilities for keying transmitter on and off, amplifying incoming audio to loud speaker level and amplifying microphone output to telephone line level, and permits use of two microphones either singly or simultaneously.

Anuual FCC report available

The 20th annual report of the Federal Communications Commission for the fiscal year 1954 is now on sale for 50 cents by the Superintendent of Documents, Government Printing Office, Washington 25, D. C.

The 159-page printed report contains chapters dealing with the commission and its organization, National Defense, Common Carriers (telephone and telegraph), Safety and Special Radio Services, Radio Broadcast Services, Field Engineering and Monitoring Activities, Technical Research and Laboratory Work, Frequency Allocation and Treaty Matters and lists field offices, publications, treaties and other international agreements, and past and present commissioners. A nine-page introduction summarizes the highlights of the commission's 20th anniversary year, and notes subsequent events up to the time of going to press.

The FCC report, in its section on common carriers, refers to the inquiry that has been going on concerning Bell System lease-maintenance arrangements with private radio licensees. The commission states that it is seeking to determine whether the licensees in

IN A FREE ECONOMY

Don't kick one leg out from under the stool!

FOR the consumer to be assured of ample natural gas far into the future—and for all phases of the gas industry to continue to prosper—there is one basic requirement—an increasing supply of natural gas at prices competitive with other fuels.

In the past this has been accomplished, and well, in our nation of free economy by the three principal segments of the gas industry—the producer, the transporter and the distributor. Evidence of this is the fact that 25 per cent of the nation's energy requirements are now furnished by natural gas as compared with less than 10 per cent in 1932—and the demand for more gas is still heavy.

But will it be met? The oppressive hand of federal regulation curled in a price-fixing clutch has been laid upon the producer. His is a business beset with chance and there is sharp competition between thousands of producers for the sale of their gas. But despite no monopoly, the producer is told that his sales destined for interstate commerce will be regulated and subjected to price-fixing. Yet he is given no compensating advantages, such as a protected market, normally afforded regulated public utilities. Heavy risks without commensurate return!

There it is. Price control by government in a land of free economy. Such has historically led to stagnation—loss of initiative—dwindling supply. This intolerable situation affects us all.

When one leg of the stool is shortened, the whole stool becomes shaky.

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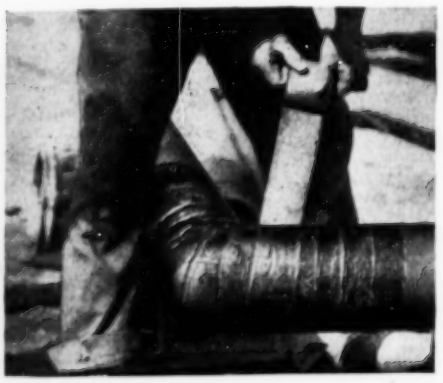

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volved have complete control over the operation of the radio equipment, whether the lease and the maintenance charges of the telephone companies may be so low that their common carrier services are subsidizing the lease-maintenance activities, whether the telephone companies may use arguments regarding the availability to prospective lessees of regular communication services to help sell the lease-maintenance service, and whether lease-maintenance activities may lead to demands that portions of the radio spectrum not now allocated to common carriers be reallocated to common carrier use.

The report also refers to the growing problem of scarcity of frequencies, particularly in the Industrial and Land Transportation Radio Services. Long-range programs having as their object the improvement of frequency utilization by such means as geographic assignment, reduction of channel spacing (split-channel assignments), and allocation of additional spectrum space to these services, are being considered, the report stated.

Recent FCC authorizations

Peoples Natural Gas Co., for one base station at Imperial, Pa., to operate on 48.70 mc.

Lone Star Gas Co., for one base station at Temple, Texas, to operate on 48.66 mc. and 48.46 mc.

El Paso Natural Gas Co., for one relay station at Flagstaff, Ariz., on 955.50 mc.

Ohio Fuel Gas Co., for one control unit on 456.55 mc. and one relay station on 451.55 mc., both at Cambridge, Ohio.

Pacific Gas & Electric Co., for one base station at Coalinga on 48.82 mc.; one control unit at Avenal on 456.15 mc. and one relay station at Coalinga on 451.15 mc., all in California.

Southern Natural Gas Co., for one base station at Augusta, Ga., on 49.06 mc.

Trunkline Gas Co. for one base station at Edna, Texas, on 49.02 mc.

United Natural Gas Co. for one base station at Siegel, Pa., on 48.98 mc.

Trunkline Gas Co. for one base station at McAllen, Texas, on 49.02 mc.

Gulf Interstate Gas Co. for five base stations near Sweet Lake, La., and Inverness and Corinth, Miss.; Holloway, La., and Hartsville, Tenn. on 48.72 mc.

Manufacturers Light and Heat Co. for one base station near Adeline, W. Va., on 33.38 mc.

Oklahoma Natural Gas Co. for one base station near Bearden, Okla., on 47.78 mc.

PACKAGED COMPRESSOR SPEEDS PENETRATION RATES ON TEST WELLS

OIL INDUSTRY TECHNOLOGISTS, investigating methods of reducing present-day drilling costs, recently started a series of tests using aerated mud. Of major importance to this program was the selection of a compressor. The unit had to deliver, automatically, full rated capacity over a wide range of pressures — to operate virtually unattended, leaving the crew free for regular duties. When moving it was essential that only oil field equipment be used and no special foundation required at the drilling site.

A Beaird-Ingersoll-Rand 4-Cycle Packaged Compressor Plant, 220 horsepower 8 JVG, was purchased by Phillips Petroleum Company for this task. Beaird engineers installed automatic controls that permit it to slow down or pick up speed over a range of 50% to 100% according to discharge conditions. A stop valve on the rig floor is all that is required to shut off air instantly for a connection or a trip. Other automatic controls safely handle this sudden change in operation — slowing the engine and unloading the compressor cylinders.

Mounted on its own heavy steel skid base, the compressor is set in a shallow pit near the rig and ballasted with sand or caliche. It moves as a single over-the-road package between drilling sites. On the new location only connections to fuel and mud lines are required to place it into operation.

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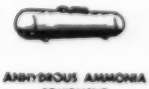

ANHYDROUS AMMONIA EQUIPMENT

LP-GAS SYSTEMS

GAS pipeline news

Mexican gas sources may be tapped by new company

Coastal Transmission Corp., a newly formed subsidiary of Delhi Oil Corp. in Houston, reportedly has plans for what may prove to be a $40 million pipeline project running some 400 miles from the Mexican border to Beaumont, Texas.

President J. O. Sue, formerly with Humble Oil & Refining Co., said that Coastal was "organized principally for purchasing gas for resale in intrastate commerce and for transporting gas for producers to markets outside the producing area." Although no positive action has been taken on the pipeline project, to accomplish the above aims a 30-in. line from southwest Texas is contemplated. Negotiations with several gas producers are under way, Mr. Sue said.

It is believed that Coastal will tap huge reserves found by Petroleos Mexicanos in the Reynosa and Comitas areas. The line would have a deliverability of about 350 MMcf daily, with plans to boost capacity to 550 MMcf.

Nevada Natural to supply Nevada power company gas

Under terms of a recently signed contract Nevada Natural Gas Pipe Line Co. will supply 11.7 MMcf per day of natural gas to Southern Nevada Power Co. for boiler fuel for Southern Nevada's new 44,000-kw electric generating plant in Las Vegas.

Expected to be in operation by next December, the new $6.5 million plant will be increased in capacity by an additional 60,000 kw at a cost of about $7 million by June 1957. At that time, according to the contract, consumption of natural gas will be increased to 28 MMcf per day.

Nevada Natural expects to spend approximately $2.5 million between now and 1957 for a pipeline paralleling its present 114-mile line between Needles, Calif. and Las Vegas.

Trans-Canada may use gas engine-driven centrifugals

The 2200-mile, Trans-Canada pipeline may be the first major gas transmission line to use relatively low speed, internal combustion gas engines to drive centrifugal gas compressors, according to engineers working on the design of the line. Heretofore the high-speed centrifugals in gas pipeline service have been driven by either gas turbines or electric motors.

Current plans would put 500-rpm, 3450-hp internal combustion gas engines on the line to drive 5000-rpm centrifugal compressors through a speed-increasing gear train. Only exception would be the first station on the western end of the line, which would be a reciprocating station.

It is reported that the internal combustion engine is under consideration over the gas turbine because of its greater fuel economy and the efficiency with which it can be operated over a wide range of load conditions. Since it is contemplated that the line load will increase considerably over the first several years of operation, designers are making provision for a corresponding increase in compressor horsepower. The flexibility of the internal combustion is, they believe, more adaptable to such an increasing load condition.

It is also reported that Westcoast Transmission may use internal combustion engines to drive centrifugal compressors on its line from the Peace river gas fields in Canada to the U.S. boundary. Again, the practice will be to use reciprocating compressors for the first one or two stations on the line.

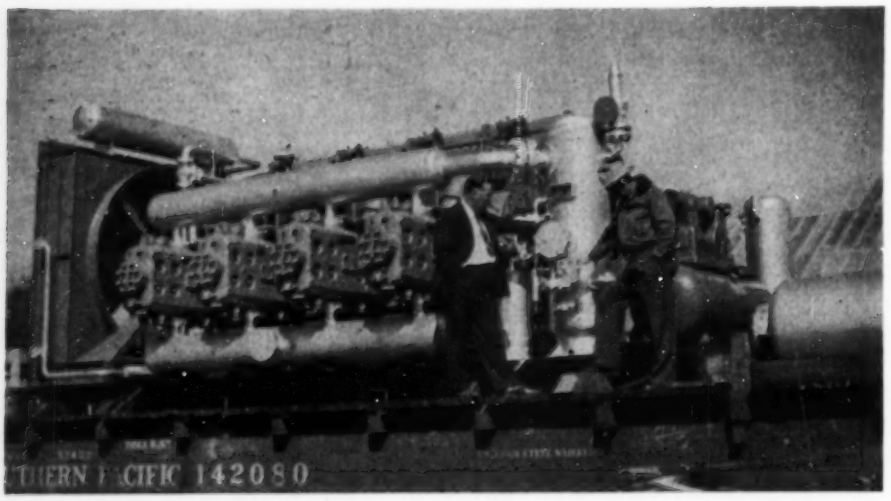
Despite leakage difficulties Herscher storing 16½ billion

Despite continuing leakage from the storage stratum, Herscher Dome storage project in Kankakee county, Ill. is now holding 16½ billion cu ft of gas, and officials of Natural Gas Storage Co. of Illinois hope that 1955-6 peak-day deliveries may reach 430 MMcf. This would be 280 MMcf higher than current deliverability.

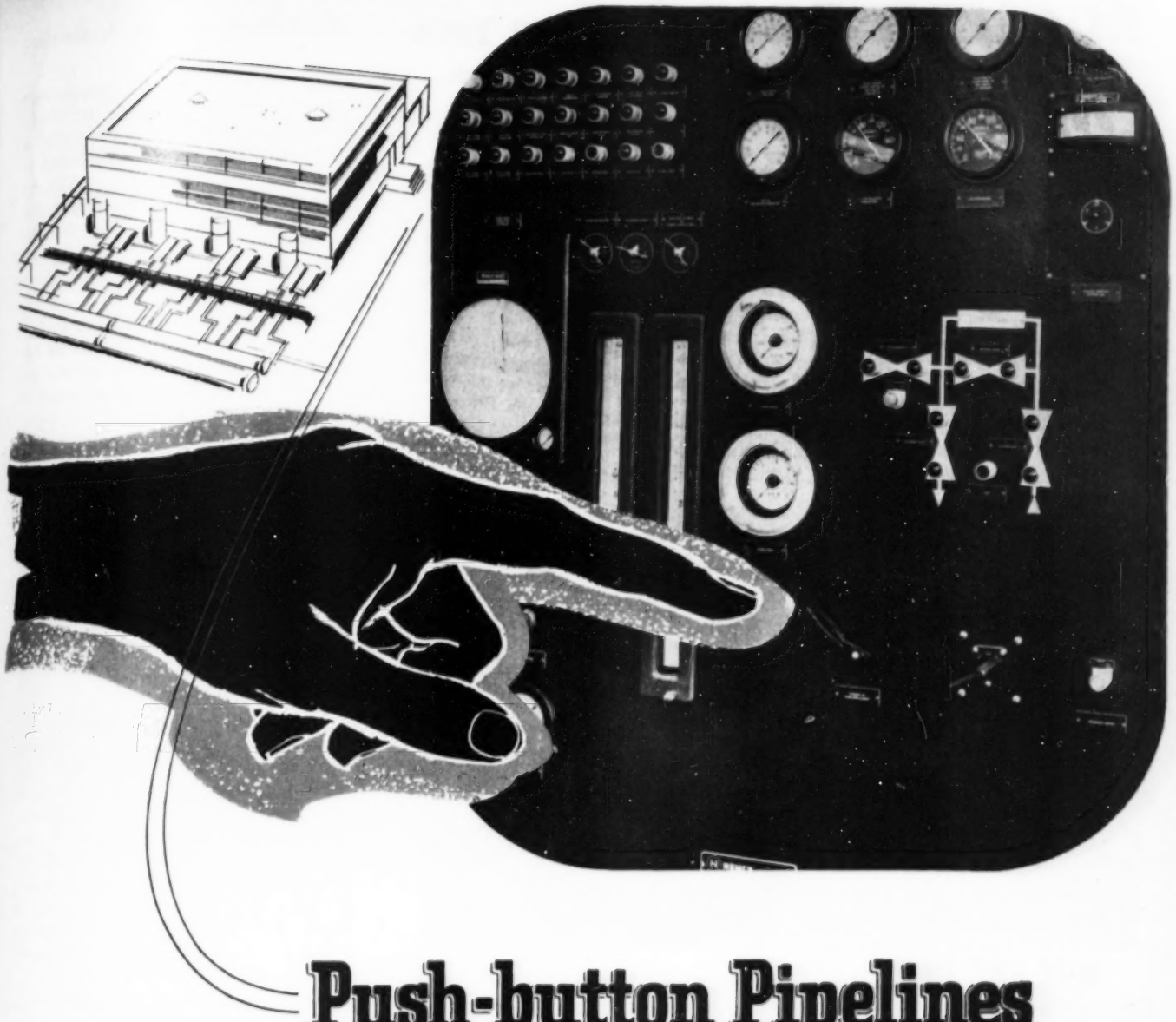
The Peoples Gas affiliate is continuing its efforts to find a satisfactory means of handling the 4 to 5 MMcf per day of leakage. The leakage control program will involve construction of a recovery and gathering system with compression facilities to repressure the natural gas before its reinjection into the storage reservoir.

Peoples gas has used every practical modern method and mechanism to locate the relatively small leak(s). Radioactive isotopes were injected in the hope that they could be traced to the source of the leakage, which was thought to be in one or more of the casing shoes at the bottom of one or more of the injection or production wells; however, this method failed to indicate trouble at this point, so that possibility of leaking shoes was eliminated. Bulk tracers, gases that have radically different chemical properties from those for natural gas, were injected and efforts were made to trace their migration to vent or production wells, but this too was not successful. Also, a thermally sensitive device was developed by the Peoples research group to attempt to locate the leaks by the temperature differential created by the expansion of the escaping gas.

When the various location efforts failed to create concrete results, more vent wells were drilled to intercept the leaking gas before it became a hazard



Southern Natural Gas Co. has recently installed this skid-mounted compressor at its Gwinville, Miss., station. This Cooper-Bessemer GMX engine and compressor has eight power cylinders developing 440 hp and pumping 17.5 MMcf of gas daily from five wells. Checked only twice a day, the unit operates as an unattended station with its Young water and oil radiator, full automatic controls, starting-air compressor and scrubber.



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pipeline news • *Cont'd.*

to the public. Leakage, though very minor in relative volumes, still is observed in several farm water wells, in some old abandoned oil wells drilled in the nearly 1900's, and in several of the vent wells. It has not been definitely established that the possibility that the gas may be coming from the old oil production horizons can be entirely discarded.

Water will be a problem to the recovery and reinjection operations because the pressure on the leaking gas is so small that it will be necessary to apply a vacuum pressure to the wells; this will mean an increase in water production. The disposal of this water will have to be directed into the producing formation, as is common practice in secondary oil recovery programs. In all probability, the recovered leakage gas will be delivered to the suction side of the compressors at vacuum pressures, so it will be necessary to three-stage at least two of the five compressors to raise the gas pressure to the 700 psig required for injection.

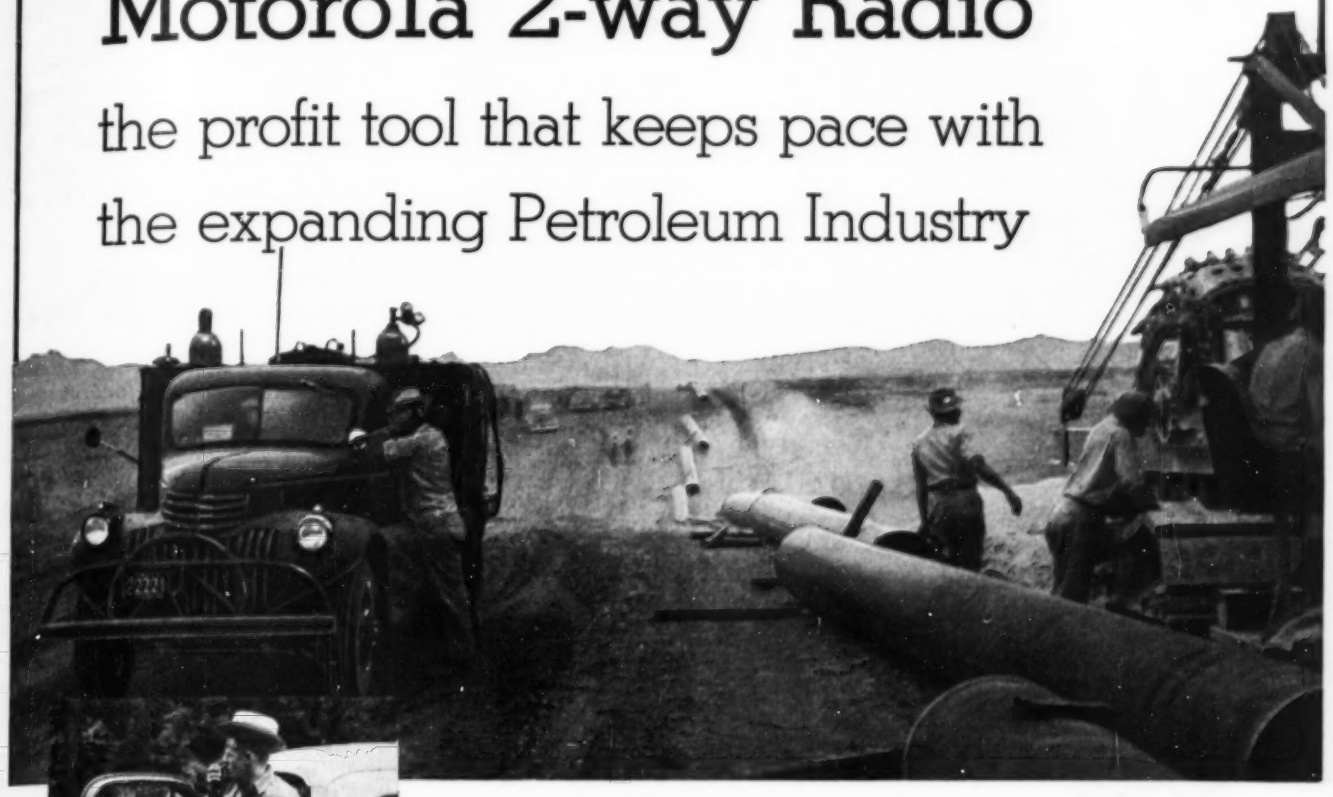
At the present time, gas from the Herscher storage project is transported through 17 miles of 30-in. line from Herscher to a tie-in with Texas Illinois' pipeline that carries the fuel into Joliet. The Tex-Ill. line is operated at near capacity, so to increase the over-all deliverability from Herscher to Joliet, Peoples will construct 30.73 miles of super-inch (36-in. diameter) line to increase the deliverability from Herscher Dome to 486 MMcf per day.

In spite of the problems that have been experienced at the storage project, the effect of its operation will not be materially reduced. At the start of the 1955-56 heating season, Peoples expects to have at least 25,000 MMcf in place in the storage stratum that will provide a send-out of at least 430 MMcf/day. This will be an increase of 280 MMcf/day over the present volume available for delivery. This 430 MMcf/day will be available for a limited number of consecutive days, but there are only about 12 max-days in the Chicago service area. The flexibility of operation of Herscher will allow many combinations for taking gas from storage; however, apparently, gas supplies will be firm enough to consider the addition of 100,000 househeating customers without undue apprehension during even an extremely severe winter.

Efforts will continue to eliminate the problems resulting from leakage and to further increase the efficiency of the operation. In view of this approach, there can be little doubt but that the vexing leakage will be located and effectively surmounted.

Motorola 2-way Radio

the profit tool that keeps pace with the expanding Petroleum Industry



On a remote strip of pipeline, a road superintendent exchanges some critical information with his spread foreman some 22 miles away saving several hours delay of another complete work unit.

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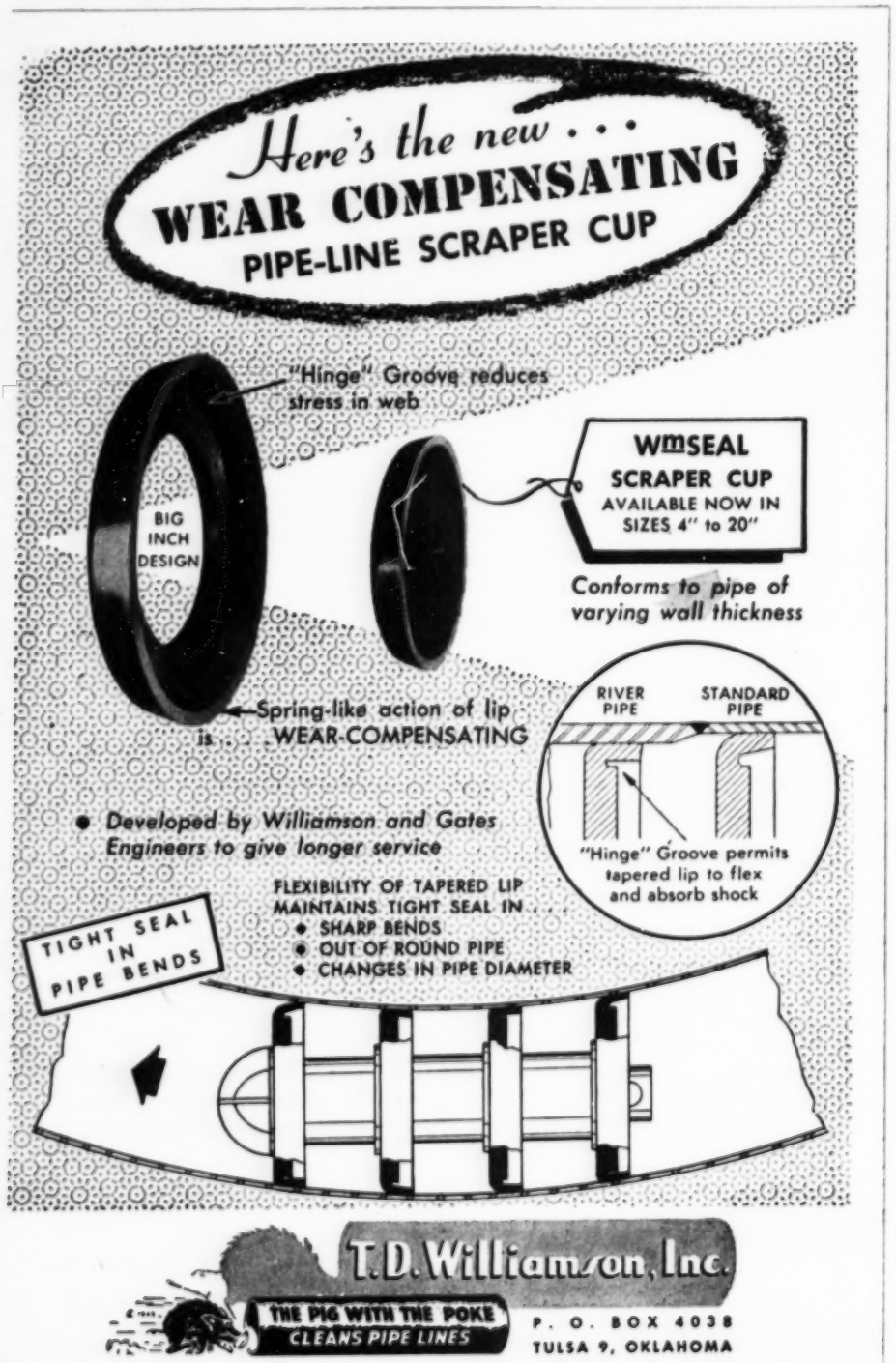
Panhandle must submit new tariff sheets

The FPC has ruled that tariff sheets filed by Panhandle Eastern Pipe Line Co., Kansas City, providing for a $12,128,000 annual wholesale gas rate increase must be denied effect unless the company revises them to exclude certain items on which the higher rates were based in part.

The tariff sheets will be without further force or effect until Panhandle files substitute sheets deleting proposed changes in rate structure and form of tariff, and containing rates no higher than those computed by eliminating the effect of "unsupported" changes in rate of return, from 5¾% to 6¾%, working capital, and allocation, and deleting two proposed new rate schedules purportedly for the sale of gas to utility customers for resale to industrial users.

In other rate actions, the FPC suspended a $577,696 increase of Phillips Petroleum Co.; approved settlement of Kansas-Nebraska Natural Gas Co.'s increase, reduced from $694,000 to $372,000; made effective subject to refund increases by three Columbia Gas Subsidiaries totaling $3,884,000 (United Fuel Gas Co., $2,668,000; Central Kentucky Natural Gas Co., $461,000; Atlantic Seaboard Gas Corp., $755,000); disallowed half of the $5,857,591 increase requested by Texas Illinois Natural Gas Pipeline Co.; approved the refund of $664,000 by Ohio Fuel Gas Co.; allowed Transcontinental Gas Pipe Line Corp. to substitute a $4 million raise for a suspended $3,204,000 increase; and made effective Tennessee Gas Transmission Co.'s suspended $8,616,000 increase.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Colorado Interstate's sales up 10½% in 1954

During 1954, Colorado Interstate Gas Co.'s sales volume increased 10½% over 1953, establishing a new peak day delivery of 757 MMcf, President W. E. Mueller told a recent meeting of the New York Society of Security Analysts.

In the past 10 years, he noted that the company's transmission system capacity was increased from 150 MMcf to 572 MMcf, pipelines in service were expanded from 680 miles to 2300, annual sales increased from 67 billion to nearly 198 billion cu ft, and gas reserves increased from 3.8 trillion cu ft to more than 5.6 trillion cu ft. "Measured by our 1954 sales volume, we have the equivalent of more than 29 years supply," he said.

Mr. Mueller believes there are substantial benefits "which accrue to consumers and the general public from the production of gas and the ownership of gas reserves by pipeline companies."

1953 revenues of industry exceed $2.75 billion

Gas operating revenues of 160 natural gas companies filing annual reports with the FPC totaled $2,779,983,000 for the year 1953, and sales of natural gas by the companies amounted to 8.45 trillion cu ft. (The 160 companies for which 1953 information is presented include 37 companies which were exempted from the jurisdiction of the commission in accordance with the provisions of H.R. 5976. The 1953 revenues from sales of natural gas of these exempted companies amounted to $651,379,041 and sales to 1.14 trillion cu ft.)

Sales of natural gas and revenues from such sales reported by the predominantly natural gas companies for 1953 amounted to 7.79 trillion cu ft and $2,278,406,000, respectively, representing increases of 9.9% in sales and 20.6% in revenues, over sales of 7.09 trillion cu ft and revenues of $1,888,575,000 in 1952. Service was supplied to an average of 7,685,000 customers

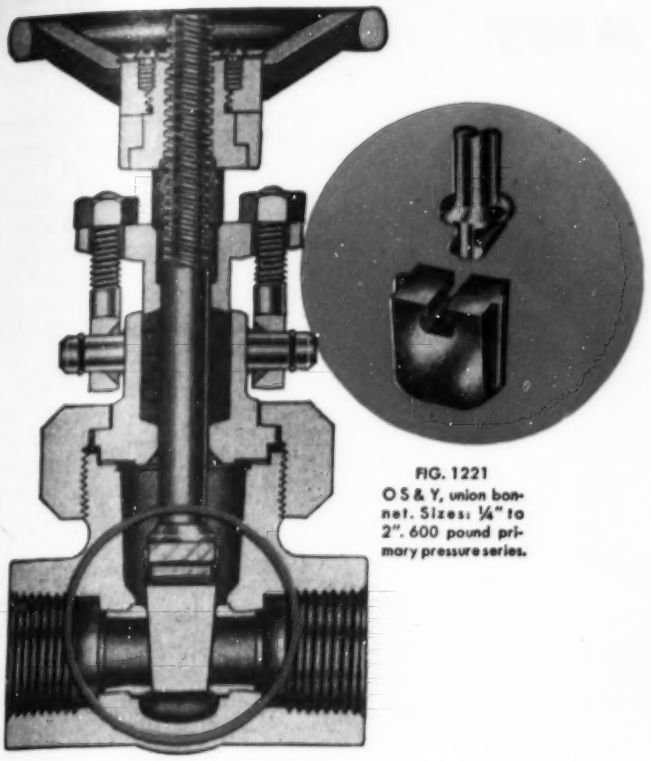

FIG. 1221
O S & Y, union bonnet. Sizes: ¼" to 2". 600 pound primary pressure series.

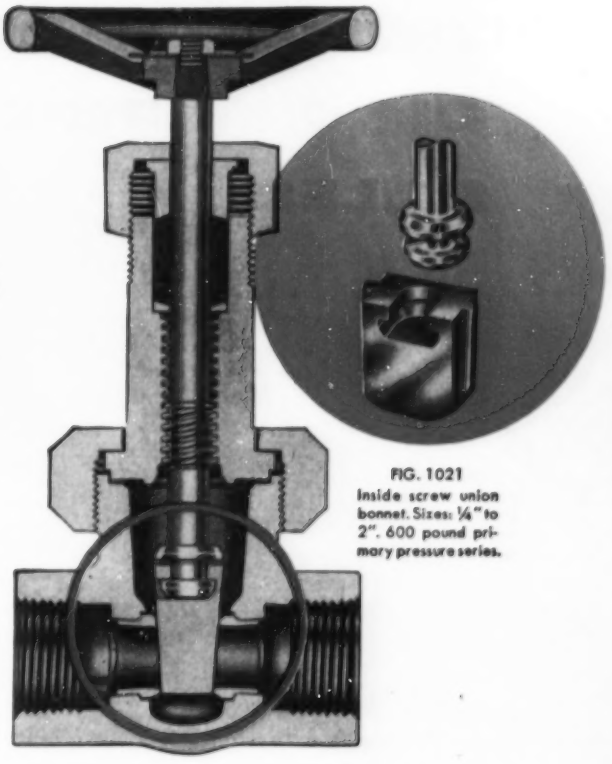

FIG. 1021
Inside screw union bonnet. Sizes: ¼" to 2". 600 pound primary pressure series.

New design makes OIC forged steel gate valves the most modern line . . .

NEW: stronger stem-to-wedge connection. Improved, modern design increases pull-out strength to many times the theoretical requirement. This design distributes the pull-out load more efficiently throughout the wedge structure to meet the most stringent specifications of valve buyers in all fields.

NEW: wedges wear longer. Wedges are made of 13% chrome stainless steel for corrosion resistance. They are duracased to at least 1000 Brinell Hardness to prevent galling and excessive wear caused by frequent closures upon foreign particles in the flow.

NEW: union bonnet design is more efficient. Body-to-bonnet joint of the male-female type provides a recess for the gasket. It is contained more securely, reducing the possibility of leakage or a blown gasket.

OTHER OUTSTANDING FEATURES

Stem threads of all OIC inside screw, forged steel valves are always contained inside the bonnet. They can't possibly load up with corrosive matter which might be in the flow. This keeps the threads clean and free running, and contributes to longer stem wear.

Modern OIC Seal-Ever packing is a special composition which eliminates electrolytic action between the stem and the packing. This prevents stem corrosion in the packing area and helps maintain a leakproof seal.

Back-seating feature provides means of repacking valves while in service.

OS & Y valve gland "I" bolts are retained on trunnions by modern, more efficient, stainless steel snap rings.

Shoulder-type seat rings are expanded into the body under heavy pressure. They are accurately machined to mate tightly with the wedge for a positive seal.

Order modern OIC Forged Steel Valves from your nearby OIC Distributor. Write and request Folder No. 195.

OIC Forged Steel Valves are also available in globes, angles and checks in a variety of trims for any service.

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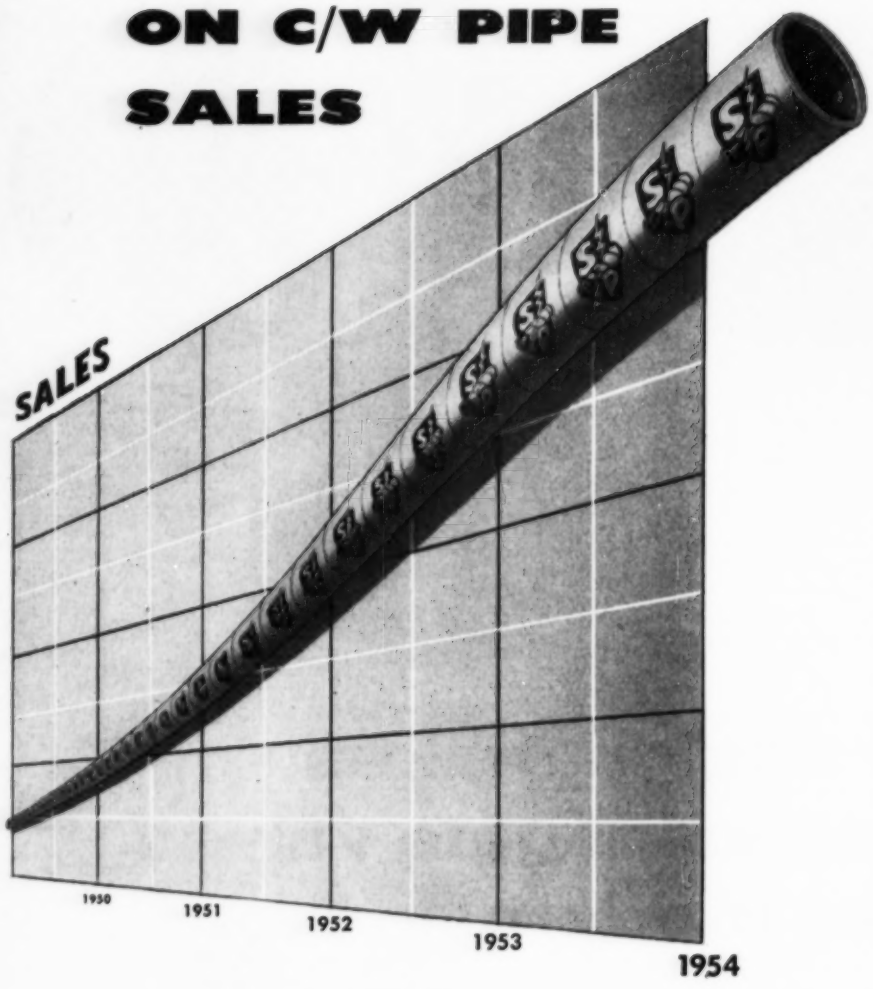
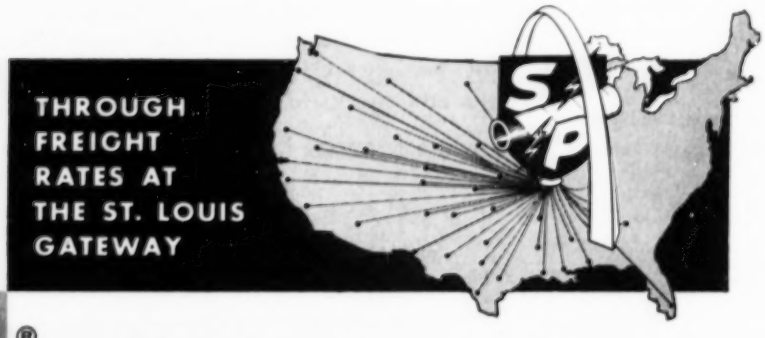


Steadily increasing sales at spi as a result of quality and service

SPI's plant includes all the machines, methods and procedures necessary to produce the finest c/w pipe. SPI's personnel are constantly aware of the value of prompt service.

For five successive years SPI has enjoyed very substantial increases in sales. Here is proof of the industry's acceptance of quality and service at SPI.



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pipeline news • *Cont'd.*

during 1953 compared to an average of 7,271,000 during 1952, or an increase of 5.7%.

Gas operating revenue deductions, including charges for operations and maintenance and provision for depreciation and taxes, amounted to $2,044,896,000 for the year and in relation to revenues increased slightly from 85.4 cents per revenue dollar in 1952 to 86.2 cents in 1953. During 1953, 66.7 cents of the revenue dollar went for operating expenses, including the cost of purchased gas, 7.8 cents for depreciation, 7.3 cents for federal taxes on income, and 4.4 cents for other federal, and state and local taxes.

Gas utility operating income for 1953 amounted to $329,115,000 and was equivalent to 5.8% of the average net gas investment for the year. For 1952 gas utility operating income was $288,232,000 and the comparable rate the same as in 1953, 5.8%.

Gross income of the companies, including income of $3,566,000 from utility operations other than gas and $14,907,000 non-operating income, amounted to $347,588,000 for 1953. Income deductions aggregated $110,882,000 for the year. Interest on long-term debt, amounting to $103,314,000 for the year, was earned 3.4 times.

Net income of the companies for 1953 amounted to $236,706,000, representing an increase of 1.9% over the $209,721,000 reported for 1952.

Dividend appropriations during 1953 totaled $180,464,000.

Book investment in gas utility plant by the predominantly gas companies aggregated $7,247,523,000 at Dec. 31, 1953, an increase of over $900 million, or 15% over the $6,300,741,000 reported a year earlier. Since the end of the war in 1945 the gas plant investment of these companies has increased just over $5 billion equal to an average annual increase of $625 million for the eight-year period. Reserves for depreciation at the end of 1953 amounted to $1,450,304,000 compared to $1,292,810,000 at the end of 1952. Reflecting the addition of new plant during the year the ratio of reserves to plant at the end of the year, 20.0%, was down slightly from the 20.5% of a year earlier.

Curtailment procedure established by FPC

An interim decision has been filed by a Federal Power Commission presiding examiner setting up the procedure to be followed by Panhandle Eastern Pipe Line Co., Kansas City, Mo., if it becomes necessary to curtail natural gas deliveries to its customers in

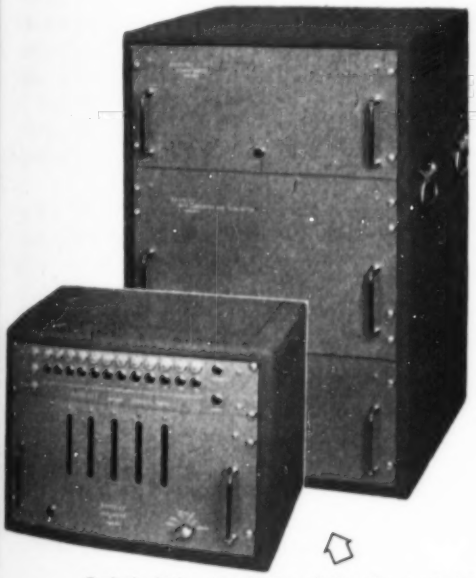
low cost telemetering

solves data communication problem for Gulf Interstate

Single teletype line links 10 stations and Houston disatcher's office in low-cost Automatic Telemetering System for Gulf Interstate's 845-mile gas pipelines.

Actual recording on standard teletype paper; 8 of possible 12 channels being used. Flow, temperature, or shaft position can also be transmitted.

Station Code	Channel Code	Data	(Suction, discharge and compressor pressures; r.p.m. of compressors, 1, 2, 3 and 4; test frequency)							
010	1	740	2	645	3	735	04	380	06	781
	01	345	02	375	03	364				



Typical station installation. Meter (lower photo) also provides digital reading of data from any 12 transducers in the station without transmission; may be set for automatic test scanning.

If you have a problem involving the gathering, recording and transmission of operating data or automatic measurement-control systems, BERKELEY's Industrial Systems Group offers experienced assistance. Why not call or write for complete information *now?* Please address Industrial Systems, Dept. V2.

problem: How to link together 5 compressor stations, 5 gathering and distribution stations and the Houston dispatcher's office in a low cost system for telemetering pumping station data over distances of 1,000 miles.

solution: BERKELEY Automatic Teletype Transmitting System. Analog-to-digital transducers provide accurate measurement of pressure, temperature and r.p.m.; data is coded for transmission over A.T.&T. wire to remote teletypes. Houston dispatcher or any station operator can obtain up to 12 items of pumping station data in 45 seconds by dialing desired station's code number.

features include:

1. **Direct digital recording of data from any remote location on standard teletype paper.**
2. **Accuracies to ± 0.1% for pressure, temperature, r.p.m.**
3. **45-second transmission time for up to 12 readings from any station.**
4. **Low cost—less than $10,000 per station, including transducers.**
5. **Automatic check of all electronic circuits during each transmission.**
6. **Instant information at your fingertips.**

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the Midwest during this winter.

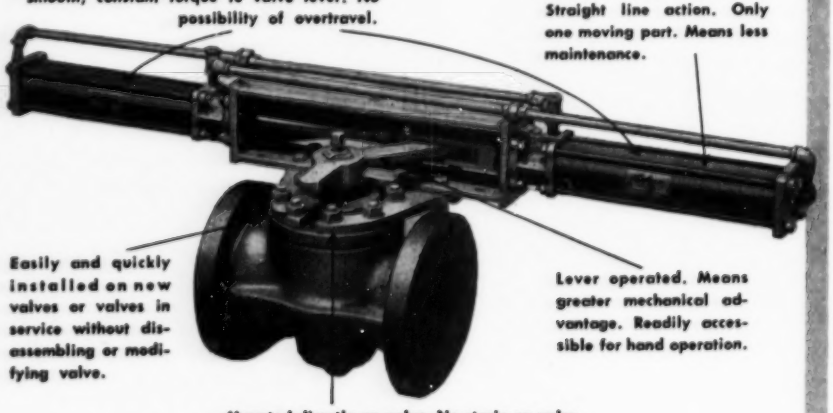
The presiding examiner found that the delivery capacity of Panhandle's system was at least 969 MMcf of gas per day at the time the hearings in these proceedings were concluded last Aug. 6, while the maximum estimated firm demand would reach 1,069,458,000 cu ft per day—assuming a concurrent peak of all of Panhandle's customers and a mean temperature of zero degrees Fahrenheit throughout the entire Panhandle system north of the Kansas-Oklahoma line.

Panhandle received temporary authority from the FPC last September 2 to construct, but not to operate, new pipeline facilities which will increase its system capacity by 100 million cubic feet per day (see accompanying story). The curtailment plan provided for in the decision is to be effective as to the mainline only pending the start of operation of the facilities.

The procedure requires that—after full curtailment of all of Panhandle's direct industrial customers and of storage gas deliveries—Panhandle shall proportionately curtail deliveries to general service and limited service customers on a uniform percentage basis up to 10% of all firm requirements. However, no general service customer is to be curtailed by more than 90% of its requirements for large industrial customers. If further curtailment is necessary, it is to be accomplished by further proportional and percentage curtailment of deliveries to Panhandle's limited service customers.

The decision also limits deliveries on Panhandle's Liberty, Missouri, lateral to the volumes made available to the resale customers on the 1953-1954 winter peak day, whenever it becomes necessary to curtail service to any resale customer on that lateral.

Here is a Simple, Dependable, Safe Plug Valve Operator


Two cylinders working in tandem transmit smooth, constant torque to valve lever. No possibility of overtravel.
Cylinder-type operator. Straight line action. Only one moving part. Means less maintenance.
Easily and quickly installed on new valves or valves in service without disassembling or modifying valve.
Lever operated. Means greater mechanical advantage. Readily accessible for hand operation.
Mounted directly on valve. No strain on valve or stem. No special manifolds necessary.

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Underground activities for Texas Eastern okayed

Texas Eastern Transmission Corp., Shreveport, and New York State Natural Gas Corp., Pittsburgh, have been authorized to construct, operate and acquire additional underground natural gas storage facilities as part of their joint Oakford storage project in Westmoreland county, Pa. (Docket G-2784).

The companies will construct and operate additional field pipelines to connect wells in the southern portion of the Murrysville pool with the existing field pipeline system.

The companies also plan to acquire a 2000-hp field gathering compressor station from the Peoples Natural Gas Co., Pittsburgh, and to install an additional 1980-hp at this station.

Companies compromise on New York-New Jersey plans

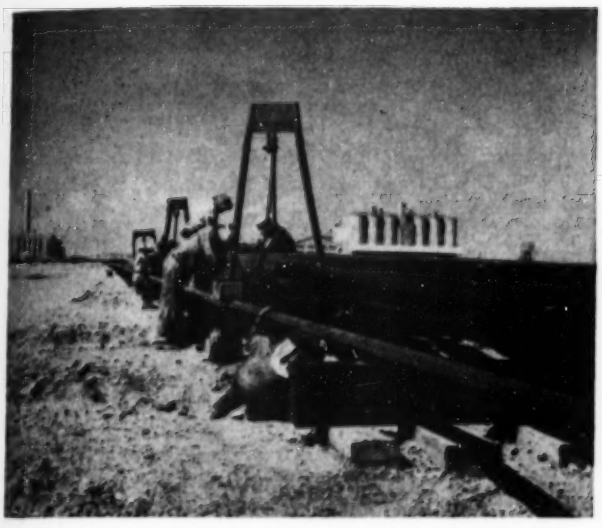
Four interstate pipeline companies have been authorized to construct natural gas transmission facilities and develop underground storage areas in projects which together will cost more than $80 million (Dockets G-2310 et al).

The commission also approved a settlement under which two of the companies—Tennessee Gas Transmission Co. and Transcontinental Gas Pipe Line Corp., both of Houston—will compromise competing proposals to serve six utility companies in the New York-New Jersey area. Transcontinental now sells gas to all six and Tennessee originally had proposed to initiate service to four of them in competition with Transcontinental.

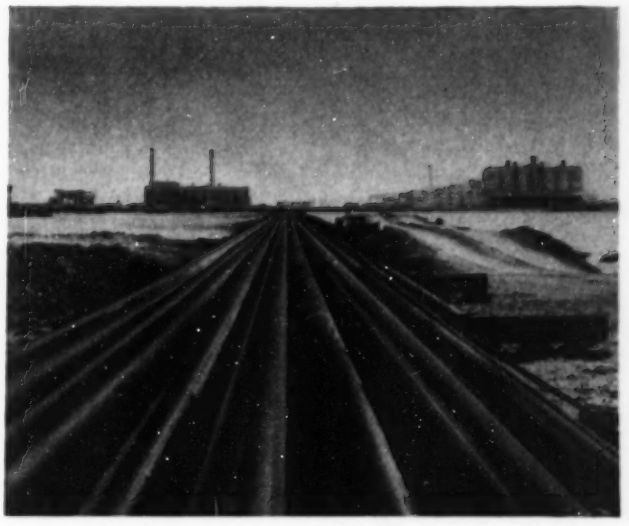
The largest of the authorized projects dollarwise is Transcontinental's, which will cost $29.7 million. Tennessee, however, will carry out one expansion project costing $28.7 million, and will participate in two more underground storage programs with other companies.

Here's how they KO'd on this Refinery Pipe line!

1. It takes no special equipment to apply Pitt Chem. Here, applicators brush on 101 about 12 mils thick.



2. Pitt Chem applies easily, even on awkward underside. Crew learned to apply it in a few minutes.



3. Pitt Chem 101 was economical to purchase and apply. It will protect this line against corrosion for years.

MAINTENANCE engineers at this Southwestern refinery realized that no ordinary coatings could protect these pipelines from the metal-eating conditions they faced. Today, the lines are safely protected with an impervious film of *Pitt Chem*® Tar Base Coating, the material that *naturally* resists practically all major types of industrial corrosion.

Pitt Chem Tar Base Coatings are tailor-made for protecting oil producing and refining equipment against corrosion. They are highly resistant to petroleum products as well as mineral acids, alkalis and moisture. They are economical to buy and easy to apply.

No other material does such a complete job of protection at so little cost. That's a big statement, but our corrosion engineers have the facts to prove it.

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spending an additional $14,647,221. These are joint projects by Tennessee and Iroquois Gas Corp., Buffalo, and by Tennessee and New York State Natural Gas Corp., Pittsburgh.

The Transcontinental project will include a total of about 173 miles of 30- and 36-in. loop line, paralleling sections of its existing system, plus a total of approximately 58 miles of 12- and 16-in. line. These facilities, together with additional compressor capacity at existing stations, will enable Transcontinental to increase its system capacity by 37,275,000 cu ft of gas per day, to supply additional gas to its New York-New Jersey area customers.

Transcontinental originally had proposed a much larger expansion program, in which it sought authority to build facilities to increase deliveries to customers in this area by 93,490,000 cu ft per day. The FPC, however, authorized only those facilities which were included under the compromise, and reserved decision on all other portions of the proceeding—such as requirements of Transcontinental's southern customers and gas reserves—pending further hearings. In a concurrent order the FPC consolidated this proceeding with the Jan. 17 hearing already scheduled on another Transcontinental application, proposing to increase deliveries to 36 existing and two new customers.

Tennessee was authorized to build about 243 miles of 24-in. line from the Hebron storage field in Potter county, Pa., extending to a connection with existing facilities near Greenwich, Conn. Tennessee also will build about 18 miles of 24-in. line connecting the Hebron field with the Harrison storage field facilities in Potter county, Pa., and Steuben county, N. Y.

These facilities will be used in part to render service to the companies in the New York-New Jersey area, under the compromise plan. Tennessee will deliver the following quantities (cubic feet per day) to these companies: Brooklyn Union, 20 MMcf; Consolidated Edison, 25 MMcf; Long Island Lighting, 5 MMcf; and Public Service Electric and Gas, 25 MMcf.

Transcontinental, under the compromise, will serve these customers with the following additional amount (cubic feet per day): Brooklyn Borough Gas, 1 MMcf; Brooklyn Union, 5 MMcf; Consolidated Edison, 5 MMcf; Kings County Lighting, 500 Mcf; and Public Service, 25 MMcf.

The compromise plan also provides for Transcontinental to transport for Tennessee up to 25 MMcf of firm gas and up to 30 MMcf of storage gas daily for delivery to Public Service. Tennessee will pay Transcontinental a transportation fee of $200,000 per year.

In addition, the FPC authorized Tennessee to sell 39 MMcf additional, as proposed, to four of its present customers.

The FPC also allocated 20,980,000 cu ft gas from Tennessee's system to four interveners.

The FPC directed Tennessee to sell an additional 24,375,000 cu ft per day to Equitable.

Iroquois and Tennessee, in their joint project, will develop the Colden Storage field in Erie county, N. Y., with an estimated capacity of 10 billion cu ft of active gas. Tennessee will acquire from Iroquois an undivided one-half interest in the facilities. Estimated cost is $2,672,000 for Iroquois and $7,982,974 for Tennessee, including base storage gas.

The joint Tennessee-New York State Natural project will include the acquisition, development and joint operation of underground storage facilities in northern Pennsylvania and southern New York.

Temporary authorization granted Panhandle

The Federal Power Commission has granted temporary authorization to Panhandle Eastern Pipe Line Co., Kansas City, Mo., to operate new facilities which are designed to increase the company's system capacity by 100 MMcf of gas per day, to a total of 1070 MMcf.

The commission's order also makes an interim allocation of the additional capacity which will be available. The facilities which Panhandle was authorized to operate are part of a larger expansion program designed to increase its pipeline system capacity by 455 MMcf daily.

The interim allocation of gas which the commission made is for the current winter period, pending a final determination of Panhandle's overall expansion application.

In its application for temporary authorization to operate the facilities, Panhandle proposed to distribute among specified customers 98,305,000 cu ft of the additional capacity. The FPC, however, ruled that the company's proposal did not provide for an equitable distribution, and established an interim allocation as a condition of the temporary authorization.

The commission first made allowance for that portion of the 100 MMcf that would permit Panhandle to serve the winter contract demands of its mainline customers, and provided for an allocation of 24,173,000 cu ft for the company's Liberty lateral in Missouri. Of the remaining 66,842,000 cu ft, 1 million was reserved for Northern Indiana Fuel and Light Co., pending final

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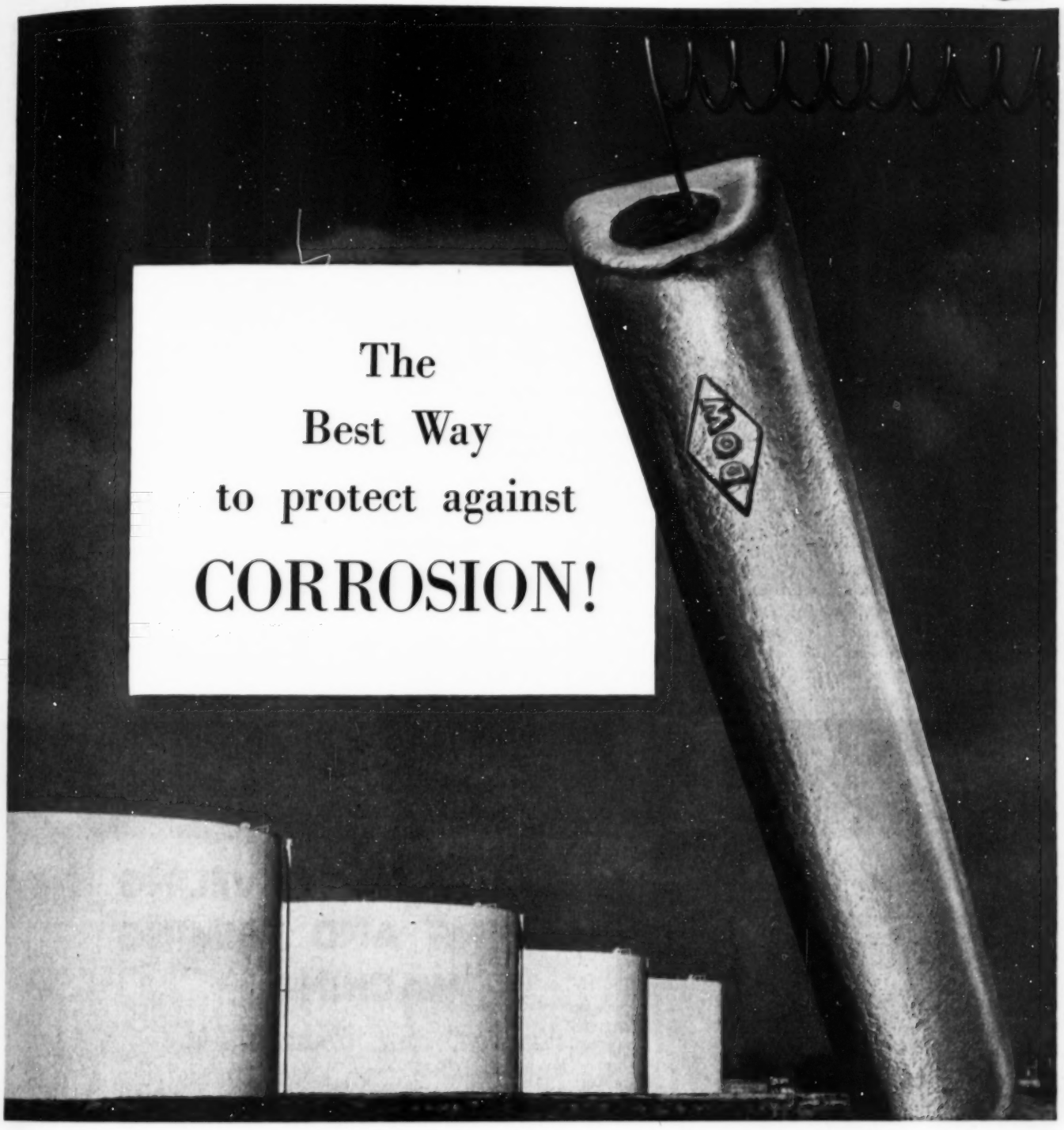

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determination in another proceeding. The FPC then distributed the remaining 65,842,000 cu ft among Panhandle's customers.

In a separate opinion, Commissioner Nelson Lee Smith concurred in the action but said he did not want this to be interpreted "as approval of the course which has been followed . . ." Pointing out that the facilities have been constructed and are available to supply gas to some of Panhandle's customers, he said that "it is hard to see what useful public purpose would now be served by my objecting to permitting the utilization of these facilities to bring gas to customers and revenues to the pipeline . . ." However, he continued, the commission's action of last June 30 denying temporary authority to Panhandle "was correct and sound on grounds of both law and policy and should not have been reversed on Sept. 2, 1954."

He also said that he has "grave questions as to whether those objecting to the issuance of the temporary certificate, as well as Panhandle's present and prospective customers who are not favored with additional gas supplies under this arrangement, have been afforded their proper measure of due process." Commissioner Smith declared that the FPC has never before, so far as he has been able to discover, "permitted on such a basis the construction or operation of anything approaching the major expansion here provided for." In concluding, he said that it was clear to him that Congress intended that hearings should be mandatory before certificates are issued, except in cases involving emergency situations and minor changes. "We should be careful, as a matter of law, to guard against the circumvention of this requirements," he added.

Tennessee Gas to buy fuel from South Texas Oil

An agreement has been reached between South Texas Oil & Gas Co. and Tennessee Gas Transmission Co. whereby South Texas will supply gas to TGT from its producing properties in south Texas.

Initial deliveries will be 10 MMcf daily. The 20-year contract will be renegotiated annually, providing for the sale of gas based on delivery of a million cubic feet daily for each 10 billion of underground reserves.

The price, which is rumored to be 11 cents per Mcf, will be raised periodically at a rate calculated to increase it 1 cent per Mcf every five years.

Tennessee Gas will build gathering facilities into South Texas' producing wells in north Jackson county and Jim Wells county, following receipt of FPC approval of the project.

Michigan Consolidated asks FPC deny Canadian export

Michigan Consolidated Gas Co. has asked FPC to refuse permission to Panhandle Eastern Pipe Line Co. to export natural gas to Canada. The company told the commission it wants to buy up to 10.5 billion cu ft of gas annually which Panhandle wants to sell to Union Gas Co. of Canada Ltd. on an interruptible basis.

Michigan Consolidated made its request at a hearing on Panhandle's expansion program, which includes the export plan.

Panhandle vice president, Fred H. Robinson, testified that the gas his company proposes to deliver to Union would be in excess of gas needed to meet the firm requirements of the pipeline's contract customers. Panhandle has a 20-year contract with Union which provides that the Canadian company may stop its purchases from Pan-

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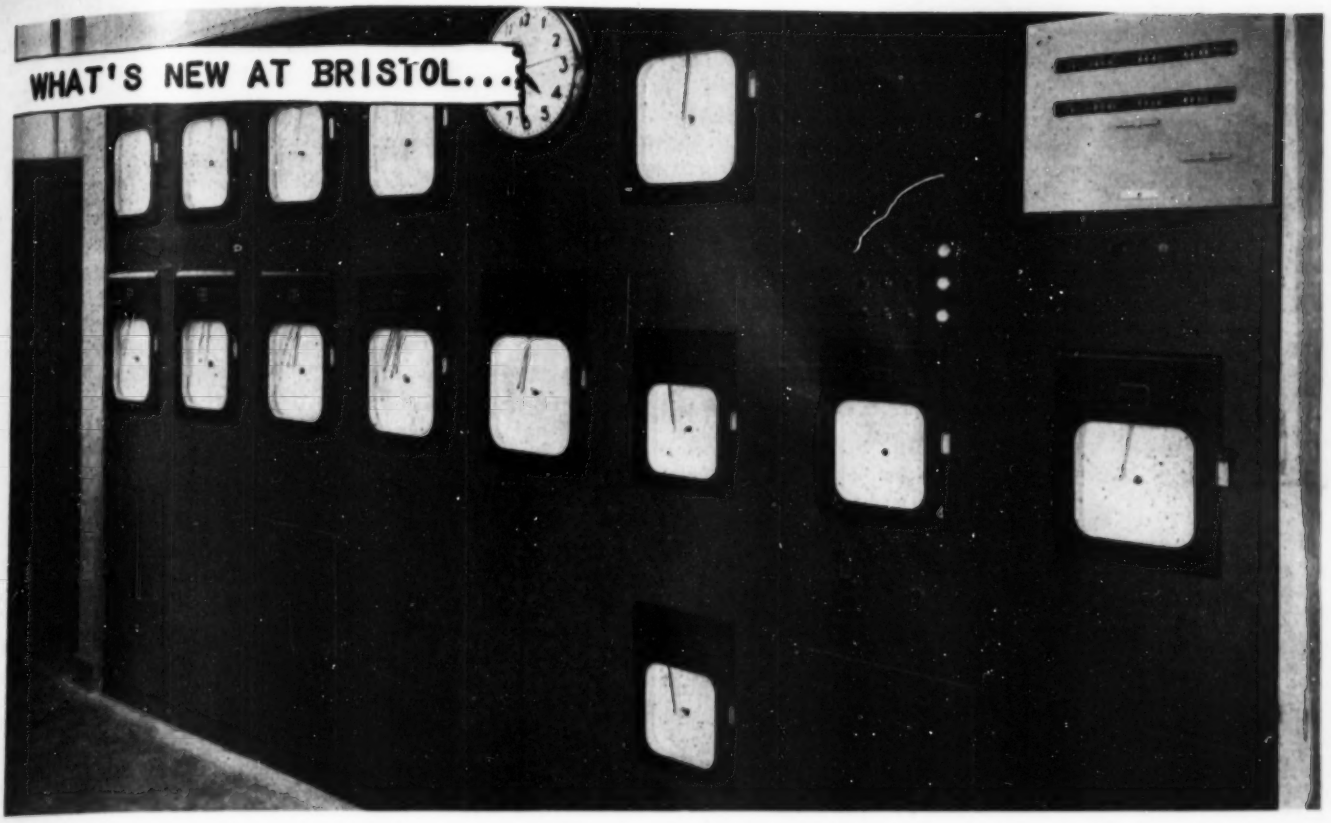

IN SAN FRANCISCO. Control panel at the new Point Richmond Holder Station of the Pacific Gas and Electric Co. The Bristol Metameter Receivers on this panel record readings of flow and pressure at focal points of load in the natural gas distribution and transmission systems for San Francisco Bay section. This installation is part of an elaborate system of Metameter Telemetering and remote control, involving distances up to 50 miles, used on this company's far flung network of pipe lines throughout northern and central California. This company is using Metameters that have been in operation since 1935.

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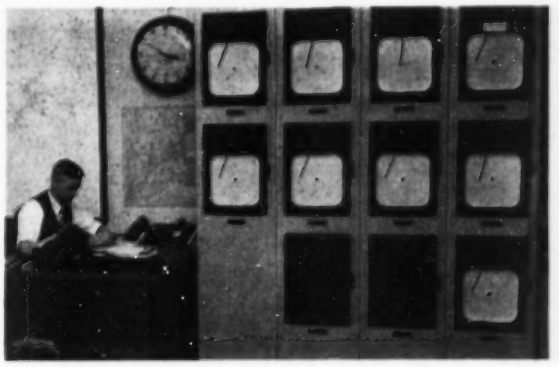

IN SPRINGFIELD, MASS. Dispatching Office of Northeastern Gas Transmission Co., in Springfield, Mass. Pressure readings from six New England points are received by the two Time-Multiplex Receivers shown on the bottom of the panel and individually recorded by the 9 Metameter Receivers. With the new Bristol Multiplexing equipment, up to 15 readings can be transmitted over a single circuit. Thus, tremendous savings are made in circuit costs. .3.34

BRISTOL

LOOK FOR OUTSTANDING NEW DEVELOPMENTS FROM BRISTOL

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AUTOMATIC CONTROLLING, RECORDING AND TELEMETERING INSTRUMENTS

CLEANING, COATING, WRAPPING & RECONDITIONING

★

HOT DOPE

Straight from the Kettle on PIPE PROTECTION

★

By Boyd Mayes

• Every so often I keep seeing in the paper that Congress may have to raise the legal debt limit so the government can keep operating. Seems to have gotten past the point of ever hoping or thinking about reducing the national debt. Brings to mind some fellows I've heard say they'd feel successful when they could owe a million dollars. At the rate we're going, looks like the national debt will have us all owing at least a million a piece before too many years. Looking at our debt that way—guess there ain't no question but that we've got the most successful government the world has ever seen—and gettin' more so every year. Personally, though, I'm mighty proud to live here no matter how successful we get.

And I'm mighty proud of another thing—that's the PERMANENCE we've been putting into pipe for well over a quarter of a century. We've got the plant, men and machines to do any job for you—successfully.

★

MAYES BROS.

1150 McCarty HOUSTON, TEXAS Orchard 7506

pipeline news • *Cont'd.*

handle within a year after completion of the TransCanada pipeline.

For more than three years, Panhandle has been trying to get the FPC to reduce its deliveries to Michigan Consolidated. Although a contract between the two firms expired in 1951, the commission has required Panhandle to maintain deliveries at the old contract level of 127 MMcf a day.

Transco signs agreement for joint lease development

Transcontinental Gas Pipe Line Corp. has signed a contract with Dome Gas & Oil Corp., a wholly owned subsidiary of North Star Oil & Uranium Corp., for joint development of Dome's oil and gas leases in Ulster county, New York, upon which the first test well is now about three-quarters completed. It is believed that this contract for as yet unproven wildcat acreage is unique in the oil and gas business, according to Stewart A. Currie, president of Dome.

In March 1954 Dome commenced drilling its first test well on a 12,000-acre block of leases. The goal is natural gas production in the Oriskany sand at about 5500 ft. This test well is now drilling at about 4100 ft.

Until it exercises its option to buy the gas, Transcontinental must reimburse Dome each month for 50% of Dome's cost of drilling all subsequent wells until sufficient gas reserves are developed to justify Transcontinental constructing a pipeline.

Upon exercise of the option, Transcontinental must build a 125-mile pipeline between New York City and Phoenicia, sufficient to transport a minimum of 25 MMcf of gas daily, and Transcontinental must then pay Dome for that daily minimum quantity of gas.

Gas purchases pursuant to this agreement will be at a price of $.275 per 1 Mcf. This price is believed to be one of the highest prices ever paid by a pipeline for large volume gas purchases. The price stipulated for Ulster county gas is justified by its closeness to the New York Metropolitan area.

Dome and Transcontinental agreed to interchange all geological and engineering data concerning this drilling program. Locations, drilling contracts and testing of all wells drilled under this program will be under the direction of Transcontinental's geologists.

If gas or oil in commercial quantities is found in the Herdman No. 1 well now drilling, Dome has agreed that it will commence a series of wells each starting 30 days after completion of a prior well.

So long as this option is effective, Transcontinental has agreed that it will not lease or solicit leases nor enter into any agreement similar in whole or in part to its agreement with Dome with reference to other properties in Shandaken and adjacent townships. This exclusive area comprises nine townships with 424,859 acres.

Access to new gas reserves granted Transcontinental

Twenty-one certificates have been granted in connection with a proposal by Transcontinental Gas Pipe Line Corp., Houston, to gain access to additional natural gas reserves in Chambers, Jefferson, Orange and Galveston counties, Texas. (Docket G-2405 et al).

Transcontinental will build facilities, estimated to cost $1,076,000, which will connect its pipeline system with a line to be built by Texas Gas Pipe Line Corp., Houston. The FPC at the same time authorized Texas Gas Corp., also of Houston, to transport gas to Texas Pipe Line, and granted 18 certificates to independent producers authorizing them to sell natural gas to Texas Pipe Line or Texas Gas Corporation, or both.

The facilities to be built by Texas Pipe Line include a 1600-hp compressor station and 2.37 miles of 12¾-in. pipe extending across the Texas-Louisiana state line to a connection in Cameron parish, La., with a lateral to be built by Transcontinental. Estimated cost of Texas Gas Pipe Line's project, including facilities to be acquired, is $1,084,329.

Transcontinental's lateral will consist of 25.37 miles of 12-in. pipe in Louisiana extending from its main transmission line in Calcasieu parish to the proposed Cameron parish connection with Texas Pipe Line's facilities.

GAS pipeline notes

The Board of Transport Commissioners in Ottawa has given TransCanada Pipe Lines Ltd. a four-month extension in which to show satisfactory arrangements for financing its proposed $300 million line from Alberta to eastern Canada. The original deadline set by the board was Dec. 31, 1954.

Tennessee Gas Transmission Co., Houston, has been authorized to acquire and operate the facilities of its subsidiary, Tennessee Production Co., also of Houston. Tennessee Production is an independent natural gas producer, with its principal properties located in the Gulf coast and west Texas areas. Approximately 91% of the gas produced by Tennessee Production is sold to Tennessee Transmission, which now owns 48.7% of the subsidiary's outstanding common stock.

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gives lasting protection against pipeline corrosion!

ON JOB AFTER JOB, Johns-Manville Trantex Tape is controlling corrosion and extending the service life of underground gas and oil pipelines.

Trantex is a durable plastic tape that sticks on contact—bonds tightly to the pipeline. No heat or heavy duty equipment is needed in its application. It is easily applied by hand or by specially developed hand-operated machines. Many users have found that field-applied Trantex Tape speeds coating applications . . . lowers construction costs on both large diameter transmission lines and gas distribution systems.

Trantex Tape is a development of Johns-Manville—a pioneer in the manufacture of Asbestos Pipeline Felts. For further information about Trantex Tape, write for copy of PP-26A, Johns-Manville, Box 60, New York 16, N. Y.

	*V-10	**V-20
Dielectric Strength per mil thickness, Approx.	1,000 V	1,000 V
Insulation Resistance, greater than (ASTM-D-257-49)	100,000 megohms	100,000 megohms
Temperature Limit	200 F	200 F
Adhesion oz. per inch width	30	20
Tensile Strength lbs. per inch	30	56
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"Trantex" is a black polyvinyl tape. It is available in two thicknesses—

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**V-20 is a 20 mil thickness for use where a more rugged coating is specified, such as to repair enamel coatings.

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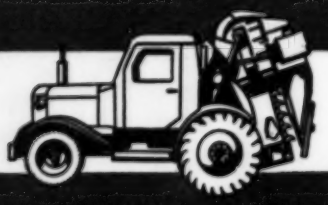

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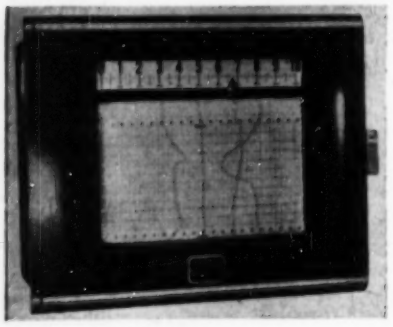
GAS new pipeline products



20 Multiple-Point Pyrometer

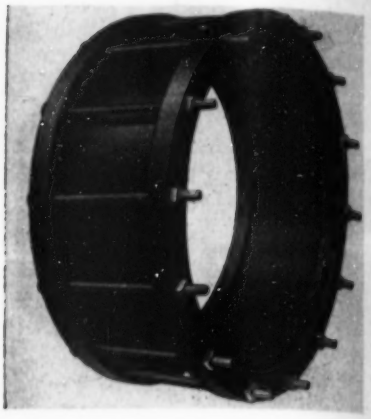
A new device that makes it simple to change reference-junction compensators when going from one type of thermocouple to another is now available on Bristol electronic Dynamaster multiple-point pyrometers.

The new development is a small, cylindrical aluminum piece, with an opening in one end into which a compensating resistor can be inserted. All reference junctions are located in the wall of the cylinder.

To change from one thermocouple to another, the compensating resistor is slipped out of the end of the unit and replaced with one of the correct value for the new thermocouple. Then the compensator wires at the input terminal block are loosened and replaced with the correct wires, which are already available.

Bristol Co.

■



21 Steel Coupling

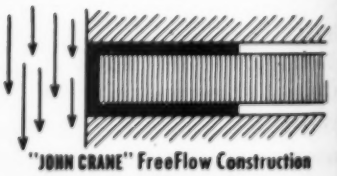
A new flexible steel coupling for large diameter pipelines (24-in. to 96-in.), announced by R. H. Baker & Co., has application in water, gas, oil and sewage lines.

The couplings provide a bottle tight seal and yet are flexible enough to allow for expansion, contraction and misalignment. Special expansion jointing is not required on a pipeline when these couplings are used on all joints. Welding is eliminated and only a wrench is required to couple a string of pipe.

Baker AllSteel couplings consist of a formed middle ring, two rubber gaskets, two follower-flange rings and heavy bolts. Two types of gaskets are available, Lastite rubber and Lastite neoprene. Middle rings are made in various thicknesses and lengths.

R. H. Baker & Co.

■



"JOHN CRANE" FreeFlow Construction

Gasket flush with pipe I.D.—allows completely unrestricted flow.
No air pocket—insert flush with I.D. of envelope. No danger of rupture due to expansion of entrapped air at high temperatures.

22 Gasket

A new development in gasket construction, which is said to eliminate flow restriction and turbulence in the line as well as danger of gasket rupture at high temperature, has been introduced by Crane Packing Co.

The inner periphery of this French-type gasket (the FreeFlow) is of "channel" construction so designed that it does not extend beyond the ID of the

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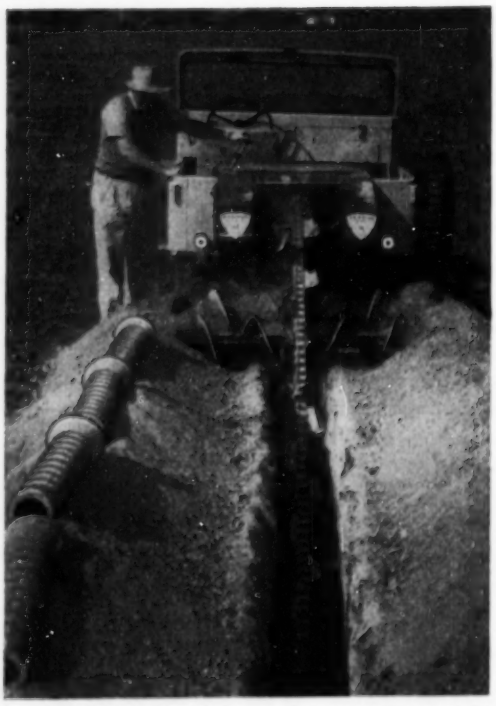

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pipe. Full contact with the pipe flanges is assured. This design also allows the insert to extend to the full depth of the gasket envelope, thereby eliminating an air space. The envelope is made of chemically inert DuPont teflon.
Crane Packing Co.

■

Trade Literature

23 Instrument Bulletin

A new general bulletin from the Bristol Co. lists and illustrates the complete line of recording automatic controlling and telemetering instruments. Featured is the new line of Metagraphic pneumatic transmission instruments.
Bristol Co.

■

24 Data Processing Catalog

"Data Processing Instruments," a 12-page general catalog from Consolidated Engineering Corp., furnishes information on the company's line of data-processing equipment. Photographs, technical specifications, and descriptive functional diagrams lend interest to the condensed descriptions of the instruments.
Consolidated Engineering Corp.

■

25 Filter Bulletin

A new bulletin with installation diagrams for Hilco gas filters has just been completed by the Hilliard Corp. Bulletin F-154, which includes the Hilco Hyflow gas filter recommendation data sheet, contains suggested installation procedures and a tabulated listing of engine horsepower.
Hilliard Corp.

■

26 Process Instrument Catalog

A new 12-page general catalog with illustrations, descriptions and basic specifications of Fischer & Porter Co.'s complete line of process instrumentation is now available. Instrumentation for measuring and controlling process variables includes: Variable-area and variable-head flow meters; pressure instruments; temperature instruments; liquid level instruments; density and specific gravity measuring instruments; viscosity and consistency instruments; electric, pneumatic, and electronic transmitting, recording and controlling instruments with alarm and integrators; and air-operated control valves in various models and construction materials.
Fischer & Porter Co.

GAS pipeline people

Tennessee Gas Transmission has promoted six vice presidents to senior vice presidents and elected seven new vice presidents. Promoted are HAROLD BURROW, N. W. FREEMAN, R. C. GRAHAM, C. A. LINGO, W. C. MCGEE JR., and R. L. MCVEY. The newly elected vice presidents are C. C. JOHNSON, W. D. WALSER, R. L. JONES, W. W. WITMER, STONE WELLS, S. C. OLIPHANT, and R. R. DEAN.

R. W. Seely

C. W. Lee

United States Steel

United States Steel Corp. has announced the following changes: RALPH W. SEELY appointed vice president-sales of Columbia-Geneva Steel division and CHARLES W. LEE to succeed him as vice president and general manager of Consolidated Western Steel division; R. E. WILLIAMS to assistant vice president-sales, Columbia-Geneva; T. R. ROONEY to vice president-production, and J. B. DU PRAU to assistant to the president of Consolidated Western.

Worthington Corp. has announced the following changes: HOBART C. RAMSEY from president to chairman of the board, succeeding HOWARD BRUCE, who has been elected chairman of the executive committee; EDWIN J. SCHWANHAUSSER, president; CLARENCE E. SEARLE, who is retiring as vice chairman of the board, will remain as director.

Kaiser Steel Corp. has appointed OLIVER D. HALE as manager of plate and sheet sales and BEN G. WISNER assistant manager of tin plate sales.

GARDINER SYMONDS, president of Tennessee Gas Transmission Co., Houston, has been elected a director of the Carrier Corp., Syracuse, N. Y.

Trans-Canada Pipe Lines Ltd., Calgary, has appointed M. S. LENT purchasing agent and J. W. TOMLINSON assistant sales manager.

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Equipped with a hydraulically-controlled blade, the 'Jeep' is an efficient backfiller. Shown here is a blade mounted on a 'Jeep' trencher—a single power unit that does both trenching and backfilling. Get details at your 'Jeep' dealer.

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GAS progress reports

APPROVED

ALABAMA-TENNESSEE NATURAL GAS CO., Florence, Ala. Docket G-2534 for 3.7 mile, 8⅝-in. near Tuscumbia, Ala.; and 350-hp addition at Muscle Shoals, Ala.

NATURAL GAS PRODUCERS INC., Colorado Springs. To construct 48.7 miles of 10-in. from northeastern Colorado gas fields to Colorado Interstate's 20-in. line and 3 miles of 8-in. and 10.1 miles of 4-in. line to connect Adena field with Fort Morgan.

TENNESSEE GAS TRANSMISSION CO., Houston. Dockets G-2310, G-2330 and G-2331 for 243-mile, 24-in. line from Hebron (Pa.) storage field to Greenwich, Conn., with 28-mile, 24-in. spur to New Jersey. Development of four more storage fields—Colden near Buffalo; Harrison and Ellisburg, both in Potter county, Pa., and State Line (N.Y.-Pa.).

TEXAS EASTERN TRANSMISSION CORP., Shreveport, and **NEW YORK STATE NATURAL GAS CORP.,** Pittsburgh. Docket G-2784 to construct field pipelines to connect up additional wells in Murrysville pool; acquire 2000-hp field gathering compressor station; and install 1980-hp station.

TRANSCONTINENTAL GAS PIPE LINE CORP., Houston. Docket G-2367 for 173 miles of 30- and 36-in. loops plus 58 miles of 12- and 16-in. Line to parallel sections of existing system in Louisiana, Mississippi, Alabama, Georgia, North and South Carolina, Virginia, and Maryland.

TRANSCONTINENTAL GAS PIPE LINE CORP., Houston. Docket G-2406 for 25-mile, 12-in. lateral line and meter station in Cameron and Calcasieu parish, La., to get additional gas in Orange, Chambers, and Jefferson (Texas) counties from Texas Gas Pipe Line Corp.

CURRENT CONSTRUCTION

ARKANSAS LOUISIANA GAS CO., Shreveport. Docket G-2307 for 134 miles of 6⅝- to 24-in. line in 11 sections, and 10,500-hp compressor station on its system in Arkansas, Louisiana, and Texas. Compressor station and 71 miles of line completed.

OHIO FUEL GAS CO., Columbus. Docket G-2464 3000 hp in additional compressor facilities at its station in Fairfield county. Scheduled for completion in February.

OHIO FUEL GAS CO., Columbus. Docket G-2522 880-hp compressor station under construction. Completion scheduled for April 15.

PACIFIC GAS & ELECTRIC CO., San Francisco. An 18-mile, 12-in. line in Colusa and Glenn counties to bring gas into Sacramento valley from two new fields.

PANHANDLE EASTERN PIPE LINE CO., Kansas City, Mo. Docket G-2433 for 575 miles of new line (294.6 miles approved), mainline loops, storage, lateral and gathering lines in Kansas, Missouri, Illinois, Indiana, Ohio, and Michigan and 113,000 hp in additional compression. Also includes development of Waverly storage field in Morgan county, Ill. Will increase peak-day delivery capacity from 970 to 1425 MMcf daily. Approved portion virtually completed. Balance awaits FPC approval.

SHENANDOAH GAS CO., Lynchburg, Va. Docket G-1448 for 39 miles of line from a point near Middletown, Va. to points near Winchester, Va. and Martinsburg, W. Va.

SOUTHERN NATURAL GAS CO., Birmingham. Docket G-1907. Construction on 150 miles of 18-in. and 4400-hp station remain for completion in 1955.

SOUTHEAST ALABAMA GAS DIST., Birmingham. A "U" shaped system of about 330 miles to serve 24 communities in southeastern Alabama from connections with Southern Natural.